Common Verbs Are Uncommon: The Dynamics of Verbal Underspecification in Chinese

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Abstract

Verbal underspecification in Chinese is manifested in the way verbs are lexically underspecified as to the number and the type of complements (i.e., arguments and argument-like adjuncts) they can take. It is, on the one hand, a reflex of the interaction between the lexicon, syntax and pragmatics, and on the other, a reflex of the general semantic underspecification of lexical items. Within the framework of Dynamic Syntax (Kempson et al., 2001; Cann et al., 2005) that allows the interaction between lexical, structural and pragmatic information during the syntactic process, I show that (i) the representation of predicate argument structure can be established dynamically at the level of propositional form which is constructed incrementally; (ii) just like semantically selected expressions, semantically unselected yet syntactically expressed expressions contribute to the enriched semantic composition (see Jackendoff, 1997, 2002; Zhang, 2005 *inter alia*) that no abstract syntactic mechanisms need to be invoked for.

Keywords: verbal subcategorization, verbal underspecification, incremental parsing, pragmatic enrichment

1. Introduction

By verbal underspecification, we mean that verbs are lexically underspecified as to the number and the type of complements (i.e., arguments and argument-like adjuncts) they can take. The Chinese examples below,¹ which contain two common verbs, are illustrative, where *le* is a perfective aspect marker and *guo* an experiential aspect marker.²

(1) a. *Women shui le.*
   we       sleep PERF
‘We went to bed.’
b. Women shui shafa.
   we sleep sofa
   ‘We sleep on the sofa’.
c. Women shui ta yige xingqi.
   we sleep it one-CL week
   ‘Let’s have a sleep as long as a week!’
d. Women shui le yige xingqi shafa.
   we sleep PERF one-CL week sofa
   ‘We have slept on the sofa for a week.’

(2) a. Women chi le.
   we eat PERF
   ‘We’ve had meals.’
b. Women chi mian.
   we eat noodle
   ‘We eat noodles.’
c. Women chi ta shiwan mian.
   we eat it ten-bowl noodle
   ‘Let us eat ten bowls of noodles!’
d. Women chi guo yige yue mian.
   we eat EXP one-CL month noodle
   ‘We ate noodles for a month.’

Out of context, high-frequency verbs like shui ‘sleep’ and chi ‘eat’ are usually classified as one-place predicates and two-place predicates, respectively. Subcategorization frames of this sort, which entails a distinction between arguments (i.e., elements identified by the lexical semantics of the verb) and adjuncts (i.e., elements unidentified by the lexical information of the verb), apparently cannot capture their syntactic behaviour shown in (1)-(2).

In the first place, let us consider (1b). Sentences like (1b) are actually a particular type of construction which is used to emphasize one’s manner of sleeping and is highly productive in Chinese, as the verb can basically be followed by any locative NP, such as bangongshi ‘office’, da chuang ‘big bed’, xiao chuang ‘small bed’, diban ‘floor’, keting ‘living room’, wuding ‘rooftop’, and dongxue ‘cave’. In the Chinese linguistic literature, sentences such as (1b) are characterized, often in contradictory terms, either as “[Vi + Non-patient Argument]” or as “intransitive verbs taking an object” (see Guo, 1999; Wang, 2001; Chen & Hu, 2003; Wang, 2007; Yang, 2007, 2009). The reason why the postverbal NP shafa ‘sofa’ in (1b) is analyzed as an object argument is that the Chinese verb shui’s behaviour in this case is analogous to the English verb ‘reside’ in ‘Liz resides in Kalamazoo’, which obligatorily takes a prepositional phrase as its complement (Cf.
McConnell-Ginet, 1982).

As for (1c) and (1d), the two sentences also represent two different types of constructions. Sentences such as (1c) are often called expletive-\textit{ta} construction in which the verb (transitive or intransitive in traditional terminology) obligatorily takes an indefinite NP as its complement (\textit{yige xingqi} ‘a week’ in (1c) and \textit{shiwan mian} ‘ten bowls of noodle’ in (2c)), and for this reason the indefinite NPs are treated as ‘quasi-object NPs’ in the literature on Chinese linguistics (see Zhu, 1982; Ma, 1983; Yuan, 2003). As another type of construction, sentences such as (1d) are used to emphasize the length of performing some act. Thus, it should be interpreted as ‘the state of us sleeping on the sofa lasted one week’, suggesting that the temporal expression, which is usually treated as an adjunct, is at least semantically obligatory. Even in an alternative verb-copying construction like (3), the temporal expression is still obligatorily used. For this reason, the whole construction is generally analyzed as a VOVC structure in the literature (see Li & Thompson, 1981; Li & Shi, 1997 \textit{inter alia}).

(3) \textit{Women shui shafa shui le yige xingqi.}
We sleep sofa sleep PERF one-CL week
‘We have slept on the sofa for a week.’

Locative and temporal expressions in (1)-(2), albeit usually treated as adjuncts, appear to function more as complements than just as modifiers of the verbs in these cases, thus blurring the argument-adjunct distinction (see Marten, 2002 for discussion of obligatorily used adverbs and adverbial clauses in English).

Moreover, cross-linguistic data lend support to the proposal that arguments and adjuncts can be treated alike in some cases. The parallelism of arguments and adjuncts can be seen in the Finnish example (4) and the Korean example (5) below, where duration/frequency, locative phrases and object NPs all receive accusative case, explicitly indicating that these ‘adjunct’ expressions are treated alike.

(4) \textit{Liisa muisti matkan vuoden.}
LiisaNOM remembered tripACC yearACC
‘Liisa remembered the trip for a year.’
(Data from Maling, 1993, quoted from Marten, 2002, p. 60)

(5) \textit{Tom-i mikwuk-ul twu pen-ul pangmwun- hay-ss-ta.}
Tom-NOM America-ACC two times-ACC visit-do-PST-DEC
‘Tom visited America two times.’
(Wechsler & Lee, 1996)

Clearly, verbal underspecification as illustrated above makes it problematic to provide a decontextualized representation of the argument structure associated with these verbs. Of course, one may give the same verb a distinct entry on a case-by-case basis, for
example, *shui* in (1a) and *chi* in (2a) a one-place predicate, *shui* in (1b) and *chi* in (2b) a two-place predicate, arguably *shui* in (1c-d) and *chi* in (2c-d) a three-place predicate, but this is undesirably done in an *ad hoc* fashion.

As a matter of fact, the phenomenon of verbal underspecification is not particular to Chinese, but seems universal across languages. As has been discussed in the literature (e.g., Goldberg, 1995, 2004, 2006; Jackendoff, 1997, 2002), verbs are not transitive or intransitive in nature, and some argument of the so-called transitive verbs does not need to be expressed obligatorily under certain discourse condition, as illustrated by the examples in (6) (Goldberg, 2006, p. 196). By contrast, some of the so-called intransitive verbs can take overt objects in some communicative context (Johnson & Goldberg, 2013, p. 1440). As discussed in Goldberg (2006), the existence of the constructions in (6)-(7) appears to motivate the claim that the underlying motivation for the expression of arguments is at root pragmatic.

(6) a. Tigers only kill at night.
   b. Pat gave and gave, but Chris just took and took.
   c. The chef-in-training chopped and diced all afternoon.
   d. “She could steal but she could not rob.” (from the Beatles song “She Came in Through the Bathroom Window”)

(7) a. The people of this small town...have been unable to pray Mrs. Smith’s two little boys home again.
   b. His thousands of travelling fans...had roared him into the Thomas and Mack Center ring.
   c. She tried to avoid blinking the tears onto her cheeks.
   d. I actually had a moth go up my nose once. I...coughed him out of my mouth.

The range of facts presented above, as has been discussed in Marten (2002, p. 2), demonstrate that the information concerning verbal subcategorization is generally underspecified, and “the establishment of predicate-argument structure is just part of the overall task of the hearer to assign an interpretation to the incoming utterance”. This is essentially a process of pragmatic enrichment, which enables hearers to construct *occasion-specific* conceptual representations of an utterance relative to context and to procedurally determine the structure of verb phrases.

The phenomenon of verbal underspecification raises a number of interesting semantic and syntactic questions. With regard to sentences like (1) and (2), one question that inevitably arises is how to characterize the mapping between syntactic structures onto logical representations of examples like (1d) and (2d), which is often taken to be of some mismatch nature (see Huang, 1991, 1997, 1998). Although there are various approaches available (e.g., Lexical-Functional Grammar, Head-driven Phrase Structure Grammar, aside from Generative Grammar) which have consolidated their methodology in ways that are sometimes similar, we still see seemingly unstoppable disputes over the relationship between syntax and semantics within a grammar and the nature of the mappings between
them.

Verbal underspecification as manifested in sentences (1) and (2) is, therefore, a typical phenomenon at the interfaces of syntax with semantics and pragmatics. Specifically, it is, on the one hand, a reflex of the interaction between the lexicon, syntax and pragmatics, and on the other, a syntactic reflex of the general semantic underspecification of lexical items. One of the theoretical challenges posed by these data is to seek a simple, universal mapping from syntactic structures onto semantic representations, irrespective of the idiosyncratic behaviour of some verbs. The flexibility of using verbal expressions in Chinese seems to suggest that verbs are not transitive or intransitive in nature and hence do not always provide a fixed syntactic structure of propositions, for it is the context that they appear in that determines the verb-complement arrays. This naturally leads us to adopt a dynamic perspective, that is, the representation of predicate-argument structure can be established dynamically at the level of propositional form which is constructed incrementally with the aid of all complements presented, and the combination of a predicate with its complements is subject to pragmatic inferences aside from selectional restrictions.

In this paper, I investigate the possibility of exploring a direct mapping between syntactic structures and semantic representations, with special reference to the phenomenon of verbal underspecification in Chinese. The theoretical framework to be employed is that of Dynamic Syntax (Kempson et al., 2001; Cann et al., 2005). Unlike many theories of syntax that define grammaticality in terms of decontextualized representations of syntactic structure, Dynamic Syntax as a parsing-based model of syntax allows the interaction between lexical, structural and pragmatic information during the syntactic process, which makes it the ideal grammar formalism to explore the phenomenon at issue. The organization of this paper is as follows. Section 2 first presents a critical review of how various approaches deal with the mapping between syntactic structures onto semantic representations and then discuss their disadvantages. Section 3 introduces the framework of Dynamic Syntax. Section 4 develops a dynamic analysis of verbal underspecification with respect to Chinese. Some concluding remarks are given in Section 5.

2. Previous Analyses

A central issue concerning verbal underspecification in Chinese is how to characterize the argument structure associated with the relevant verb. Another issue related to this central one is how to analyze the temporal expressions such as duration and frequency phrases, whose counterparts in English, as shown by the translations of (1c-d) and (2c-d) above, are usually treated as adjuncts. In the literature, there has been little systematic work on the ‘indeterminacy’ of the verbal syntax as a whole, although there exist a number of works on some specific constructions. With regard to sentences like (1d) and (2d), several relevant analyses have been proposed (see Ernst, 1987; Tang, 1994; Huang, 1991, 1997, 1998 among others). With regard to sentences like (1c) and (2c), there exists another set
of analyses (see Zhu, 1982; Ma, 1983; Iljic, 1987; Lin, 1994; Lin & Zhang, 2006 among others). I will first do a brief review of the first set of syntactic analyses, with a particular focus on those of movement nature, and then the second set.

All the analyses in the first set do not directly address the syntactic status of the duration and frequency phrases used in (1d) and (2d) in terms of argumenthood and adjuncthood, but mainly focus on the configuration of V-Duration/Frequency-O in these sentences. Let us begin with Tang’s (1994) analysis. Having noticed the distribution of duration and frequency phrases, namely, sometimes following direct objects as in (8a) and sometimes preceding direct objects as in (8b) below, Tang follows Larson (1988) and proposes that direct objects are projected in the specifier position of VP and the verb is moved to a higher functional head. Moreover, she proposes that duration and frequency phrases can be adjoined to VP, as shown in (9).

(8) a. Wo jiao  zhongwen sanshi nian le.
    I teach Chinese thirty year PERF
       ‘I have taught Chinese for thirty years.’

b. Wo jiao le sanshi nian zhongwen.
    I teach PERF thirty year Chinese
       ‘I have taught Chinese for thirty years.’

(9) \[
  \text{FP} \quad F[\text{VP} \quad \text{Duration/Frequency} \quad [\text{VP} \quad \text{Object} \quad [v' \quad \text{V Duration/Frequency}]]]
\]

As can be seen in (9), when the verb is raised to the functional head F, the duration/frequency-object order as displayed in (8b) is derived. As for the derivation of the object-duration/frequency order exhibited in (8a), Tang, following Larson’s (1988) idea that oblique expressions may be base-generated as the complement of V, proposes that duration phrases can also be projected under the minimal V’ as the complement of V. The problem with Tang’s analysis is that it does not clearly tell us when a duration/frequency phrase should be adjoined to VP and when they should be base-generated as the complement of V. Also, Tang’s analysis appears to suggest that duration/frequency phrases have a dual status: they are arguments if they follow the NP object as in sentences like (8a), but adjuncts if they precede the NP object as in (8b). This seems to be against our intuition: while the duration/frequency phrase in (8b), when following the verb directly, can be argued to be an argument-like expression (note that they are obligatorily used in this particular type of construction as discussed in Section 1), they are usually taken as adjuncts when following the direct object, given that they are not obligatorily used in this sort of sentences (which is analogous to their English translations). Furthermore, as Lin (2007) correctly points out, analyses like Tang’s, would apply blindly to any type of verb phrases, but this is empirically not true. For instance, if the object NP is a full noun phrase rather than a bare noun, only the V-O-Duration/Frequency order is possible, as shown in (10).
Huang (1991, 1997) identifies the V-Duration/Frequency-Object configuration in sentences like (1d) and (2d) as displaying some sort of syntax-semantics mismatches because, syntactically the duration/frequency phrase appears to modify a non-event-denoting noun, but semantically they actually have quantification over the event expressed by the verb phrase V-O. He attempts to explain away the syntax-semantics discrepancy by proposing a verb movement analysis, also based on the conception of VP shell proposed by Larson (1988). The verb raising analysis of sentences like (11) (from Huang, 1997, p. 57) is shown in Figure 1 (from Huang, 1997, p. 58).

Huang analyzes the top-most verb position in the VP shell as an abstract eventuality predicate indicating the event type of the verb. Sentences such as (11) are derived from a structure of gerundive nominalization, whose verbal head has moved out of the gerund VP into the position of the higher light verb DO. Hence san tian ‘three days’ in (11a) does not...
modify the bare object *shu* ‘book’ but the gerund I-bar *kan shu* ‘see book’. After the verb has raised through the intermediate nominal I(nfl) to the empty verb position associated with the abstract eventuality predicate DO, and after the perfective aspect marker *le* has been lowered, the surface form of the sentence is then obtained.

There are a number of potential problems with Huang’s analysis. First, his hypothesis concerning gerundive nominalization is rather counter-intuitive. The distribution of duration and frequency phrases, as Tang (1994) has noticed, is quite flexible. That is, they sometimes follow direct objects as already shown in (8a) and sometimes precede direct objects as shown in (8b) above. His analysis of the verb phrases in (11) as gerundive nominalization seems very stipulative, because it cannot account for the generation of sentences in the configuration [V+O+Duration/Frequency] (e.g. (8a) *Wo jiao zhongwen sanshi nian le* ‘lit. I teach Chinese thirty years PERF’). Second, as pointed out in Paul (2000), Huang’s version of the verb raising analysis, which resulted in numerous modifications of Larson’s original analysis, is far from self-evident and would run into many difficulties if it is applied to a closely related construction, the verb-copying construction as in (12), which is ‘derived’ from (11) and where each verb takes a complement.

(12) a. *Ta kan shu kan le san tian.*
   he read book read PERF three day
   ‘He read (books) for three days.’

   b. *Ta chang ge chang le liang ci.*
   he sing song sing PERF two time
   ‘He sang twice.’

Sentences like (12) would pose some problems for the VP shell analysis, such as how to accommodate the two occurrences of the same verb in the VP shell and what determines the relative order of the bare object and the duration/frequency phrase. Analyses such as Huang’s, just like Tang’s, are highly construction-particular and explanatorily inadequate if they are applied to closely related constructions.

Now we turn to the second set of analyses proposed to account for sentences like (1c) and (2c). This set of analyses focus on the distribution, interpretation and function of the third-person pronoun *ta* ‘it’ which is used as an expletive element. Chao (1968) is perhaps the first to have addressed the non-referential behaviour of *ta*, calling this pronoun a “dummy direct object”. Similarly, Zhu (1982) and Ma (1983) treat the expletive constructions like (2c) as ditransitive constructions. Their ditransitive analysis should be plausible with respect to sentences such as (2c), repeated as (13a) below, especially if one adopts a constructionist approach (see Goldberg, 1995, 2006). Unfortunately, they do not go further to discuss another type of expletive constructions like (13b), where the duration/frequency is obligatorily used (i.e., its omission would render the sentence ungrammatical as shown in (13c)), and hence can arguably be treated as an argument-like adjunct in this particular construction, as discussed in Section 1.
Based on the distributive properties of the non-referential \textit{ta}, that is, it occurs between a verb and a numeral indefinite (i.e., the post-\textit{ta} NP cannot be definite) as can be seen in all the examples given above, Lin and Zhang (2006) further propose that the expletive in question is a non-specific determiner, since it is inherently non-specific in its semantics which is analogous to the non-specific determiner \textit{any} in English. According to Lin and Zhang, \textit{ta} as a non-specific determiner heads a DP projection and selects a nominal. A question that naturally arises is, if expletive \textit{ta} and a following NP is a DP constituent with a non-specific interpretation, it cannot account for why this DP can only appear in postverbal position, but not preverbal subject position. To account for this puzzle and the puzzle that the verb preceding \textit{ta} cannot take any aspect marker, Lin and Zhang further propose that the expletive is a clitic, and hence it must be encliticized into a verb root, rather than any element that has aspectual features. As discussed in Wu and Matthews (2010), while it is plausible to treat \textit{ta} as D, Lin and Zhang’s construal of this expletive pronoun as clitic may raise some complications. In non-clitic languages like Chinese, there is no evidence that the pronominal form in question is bound to the verb. The fact that expletive \textit{ta} not only can follow a bare verb, but can occur with a verbal phrase containing a resultative element, as shown in (14) below, strongly suggests that this morpheme may not be an enclitic.

\begin{enumerate}
\item \textit{Ni bixu pao diao ta ji jin rou.} \\
\text{you must jog off it several jin (500 grams) flesh} \\
\text{‘You must jog to lose some weight.’} \\
\item \textit{Wo xiang da tong ta jige guanxi.} \\
\text{I want break open it several relations} \\
\text{‘I would like to establish a network.’} \\
\end{enumerate}

Furthermore, though various definitions of clitic as a technical term have been proposed, it is widely held that a clitic is usually prosodically deficient and hence phonologically bound to its host, and can form an accentual unit in combination with its host (see Klavans, 1985 for the categorical specification of the hosts of clitics). Unlike ‘\textit{em} in I see’\textit{em} in English, the Chinese \textit{ta} is neither prosodically deficient nor phonologically bound to the

(13) a. \textit{Women chi ta shiwan mian.} \\
\text{we eat it ten-bowl noodle} \\
\text{‘Let us eat ten bowls of noodles!’} \\
b. \textit{Women chi ta yige yue mian.} \\
\text{we eat it one-CL month noodle} \\
\text{‘Let us eat noodles for a month!’} \\
c. *\textit{Women chi ta mian.} \\
\text{we eat it noodle} \\
\text{‘Let us eat noodles!’}
verb as evidenced by the fact in (14), but instead is fully and articulately pronounced in all cases above.

In summary, the ‘non-canonical’ argument structure associated with common verbs such as shui ‘sleep’ and chi ‘eat’ in Chinese appears to be an epiphenomenon of verbal underspecification. Such phenomena pose a serious challenge to the projectionist view of the relation between lexicon and syntax, according to which the number of syntactic arguments is determined by the lexical semantics of the verb, as captured in theta theory (Chomsky, 1981, 1995). Apparently, verbal underspecification involving ‘unselected’ argument-like complements is not purely a syntactic phenomenon, which is why analyses that adopt a syntactocentric perspective would run into various problems.

The ‘flexibility’ of using various types of verbs, as manifested in Chinese examples (1) and (2) and English examples (6) and (7), strongly supports the view that verbs, like all words, address mental concepts and the exact mental concept addressed by a lexical item is constructed on the fly in the context in which it occurs (see, among others, Sperber & Wilson, 1995; Carston, 2002). To provide an adequate account of the phenomenon at issue, we need to adopt a dynamic approach that allows the interaction between lexical, structural and pragmatic information during the syntactic process. In the next section, I introduce some of the machinery of Dynamic Syntax needed for handling the phenomenon under discussion.

3. The Dynamic Syntax Framework

Being a parsing-based grammar formalism, Dynamic Syntax (henceforth DS) models natural language understanding as the monotonic growth of trees representing the semantic content of some string of words uttered in context. The process is goal-driven, beginning with the initial, universal requirement to establish propositional content for some utterance. Such content is represented in terms of binary trees establishing the argument structure of a proposition as it is constructed incrementally through general construction rules, semantic information of the lexical items in some string, and pragmatic processes of enrichment. What is distinct about the DS model is that syntactic characterizations can be grounded in the time-linear projection of the requisite predicate-argument structure. Within this framework, syntax is not construed in terms of static articulated structures as in generative grammar but in terms of how structured semantic representations are built up. The DS framework is similar to the Minimalist framework (Chomsky, 1995) in that there is only one significant level of representation, i.e. Logical Form (see Cann et al., 2005 for detailed discussion). Yet logical forms in DS are representations of semantic content, i.e. pure representations of predicate argument structure and other content, as will be demonstrated shortly.

Some significant observations have been reflected in the design of DS. First, natural language understanding is highly dependent on context and that change of context is not merely sentence by sentence, but also word by word. Second, this paradigm extends
incomplete specifications from semantics and pragmatics to the domain of syntax, and thus allows the interaction between three types of actions, lexical, computational and pragmatic during the parsing process. Concepts of underspecification, which may be structural or semantic and whose resolution is driven by the notion of requirements, play a crucial role in the construction of semantic representations. For immediate purposes, I mainly introduce some of the machinery of the DS model needed for handling the constructions exemplified in (1) and (2).

3.1 Incrementality

DS defines the way that semantic representations are monotonically constructed on a word-by-word, strictly time-linear basis. The logical form corresponding to the interpretation of a string is represented as a binary tree which encodes the argument structure of a clause, and the parsing process is the attempt to establish some appropriate tree on the basis of the words provided. Nodes in the tree are decorated with labels specifying the type of the node (label $T_y$), its semantic content shown as a lambda expression ($Fo$) and an address specifying where in the tree the node is. Requirements may be to specify values for any of the labels that decorate a node, but the principal drivers of the parsing process are requirements to establish nodes of certain types, starting from $?T_y(t)$, an instruction to build a tree rooted in $T_y(t)$, the type of a proposition.

To satisfy such a requirement, a parse relies on information from three sources. First, there are computational rules which give some templates for the building of trees. Two general computational rules called INTRODUCTION and PREDICTION allow a tree rooted in $?T_y(Y)$ to be expanded to one with an argument daughter $?T_y(X)$ and a functor daughter $?T_y(X \rightarrow Y)$, namely to find a subject and a predicate of a proposition. By this rule, the minimal tree with the initial requirement $?T_y(t)$ can be expanded to a partial tree as in Figure 2, where the diamond is the ‘pointer’ which is used to identify the particular node under development, here by convention the external argument or subject node.

Second, information about tree building may come from actions encoded in lexical entries which are accessed as words are parsed. Consider the Chinese utterance *Lisi xihuan yuyanxue* ‘Lisi likes linguistics’. All noun phrases are projected as terms of $T_y(e)$ in DS, so that a proper name like *Lisi* will project a simple individual constant and thus satisfy the current requirement. A lexical entry consists of *IF…THEN…ELSE* statements, where the *IF* clause states the condition under which the actions in the *THEN* clause can be taken, whereas the *ELSE* statement gives an instruction to abort the parsing process if the conditional action fails. Lexical entries may make reference to nodes in the tree other than the trigger node, either building them or annotating them, by employing a few
instructions such as ‘make’, ‘put’, ‘go’, which have obvious interpretations.

To formulate both computational and lexical actions in these terms, DS adopts The Logic of Finite Trees (LOFT), a modal logic for describing finite trees. This logic is central to the DS framework and utilizes a number of operators as follows:

(15) LOFT operators: $\langle \downarrow \rangle, \langle \downarrow_0 \rangle, \langle \downarrow_1 \rangle, \langle \uparrow \rangle, \langle \uparrow_0 \rangle, \langle \uparrow_1 \rangle, \langle \down\ast \rangle, \langle \up\ast \rangle$

These modalities are interpreted by a discrete relation between the nodes in a tree: $\langle \downarrow \rangle$ is evaluated over the daughter relation, so $\langle \downarrow_0 \rangle$ and $\langle \downarrow_1 \rangle$ mean an argument daughter and a functor daughter below a certain mother node respectively; conversely $\langle \uparrow \rangle$ over the mother relation, thus $\langle \uparrow_0 \rangle$ and $\langle \uparrow_1 \rangle$ mean an argument daughter and a functor daughter of a certain mother node respectively; $\langle \down\ast \rangle$ is interpreted over the dominance relation and $\langle \up\ast \rangle$ over the inverse of dominance. The way LOFT operators are used can be demonstrated in the lexical entry for xihuan ‘likes’ in the above utterance.

(16) Lexical entry for xihuan:

\[
\begin{array}{l}
\text{xihuan} & \text{IF} & \text{IF} & \text{ELSE} \\
& \text{IF} & \text{THEN} & \text{ELSE} \\
& \text{THEN} & \text{THEN} & \text{ELSE} \\
& \text{THEN} & \text{THEN} & \text{ELSE} \\
& \text{ELSE} & \text{ELSE} & \text{ELSE} \\
\end{array}
\]

\[
\begin{aligned}
& \text{IF} \quad \text{Ty(e }\rightarrow t) \\
& \text{THEN} \quad \text{go }\langle \uparrow_1 \rangle, \text{ put (Tns(PRES)), go }\langle \downarrow_1 \rangle; \\
& \quad \text{make }\langle \downarrow_1 \rangle, \text{ go }\langle \downarrow_1 \rangle, \text{ put (Ty(e }\rightarrow (e \rightarrow t)), Fo(Xihuan'), }\langle \downarrow_1 \rangle \bot; \\
& \quad \text{make }\langle \down\ast \rangle, \text{ go }\langle \down\ast \rangle, \text{ put (Ty(e))} \\
& \text{ELSE} \quad \text{abort} \\
\end{aligned}
\]

The pointer is manipulated by the lexical actions to annotate different nodes. First, it moves from the predicate node of $\text{Ty(e }\rightarrow t)$ to the top node $\text{Ty(t)}$ where the present tense information is annotated, then returns to the predicate node. Then the lexical semantics of the transitive verb xihuan ‘likes’ takes action: it not only licenses the building of a two-place predicate node, but that of an internal argument daughter with a requirement to construct a term. After the parse of the verb, the pointer moves to the $\text{Ty(e)}$ node, indicating that this is to be developed next. The tree in Figure 3 represents the parse state where both the subject and the verb have been parsed.\(^5\)

Figure 3. Parsing Lisi xihuan

\[
\begin{array}{c}
\text{Ty(e), Fo(t,x, Lisi'(x))} \\
\text{Ty(e }\rightarrow t) \\
\text{Ty(e) }\bot \\
\end{array}
\]

Finally, the NP object yuyanxue ‘linguistics’ is parsed to satisfy the open term requirement in the internal argument position, the processing of which is the same as that of the subject NP Lisi. The parsing process is not yet completed, however, as some
requirements on the tree remain to be satisfied. Completion of the tree involves functional application of functors over arguments, driven by modus ponens over types, yielding expressions which satisfy the type requirements associated with intermediate nodes. Figure 4 shows the completed tree whose top node is decorated with a propositional formula value representing the final result of interpreting the utterance. Within the DS framework, natural language syntax is thus defined as procedures for context-dependent interpretation.

Figure 4. Parsing Lisi xihuan yuyanxue

\[ Ty(t), Fo(Xihuan'(t, y, Yuyanxue'(y)))(t, x, Lisi'(x))), Tns(PRS) \]

\[ Ty(e), Fo(t, x, Lisi'(x)) \quad Ty(e \rightarrow t), Fo(Xihuan'(t, y, Yuyanxue'(y))) \]

\[ Ty(e), Fo(t, y, Yuyanxue'(y)) \quad Ty(e \rightarrow (e \rightarrow t)), Fo(Xihuan') \]

3.2 Contextuality

As mentioned at the beginning of Section 3, DS also allows pragmatic actions in the parsing process, which can be illustrated by the processing of elliptical fragments containing pronouns. Consider the short dialogue between a supervisor (daoshi in Chinese) and his secretary (mishu in Chinese) in (17) below.

(17) Daoshi: Xueshengmen xuan le shenme ke?

‘What courses did the students select?’

Mishu: Lisi jufaxue, Wangwu yuyixue, Zhangsan yuyongxue.

‘Lisi selected syntax, Wangwu semantics and Zhangsan pragmatics.’

The secretary’s answer is apparently a sort of VP ellipsis, which can be modelled as formula underspecification resolved by directly re-using a contextually provided formula value. As the display in Figure 5 illustrates, once having parsed the string Xueshengmen xuan le shenme ke? ‘What courses did the students select?’, a term of Ty(e \rightarrow (e \rightarrow t)) is available from the context to substitute for the metavariable \( U \) on the two-place predicate node in the latter tree. A process of SUBSTITUTION as such is essentially pragmatic, in the sense that the resolution of the metavariable on the second tree is heavily dependent on a term on the first tree in Figure 5.
The parsing of pronouns has the same story. Unlike proper names, which project fully specified content, pronouns in DS, while still projecting an expression of type $e$, provide only underspecified content, reflecting the fact that the processing of pronouns is context-dependent. Assuming the general stance that words provide lexical actions in building up representations of content in context, we can say that pronouns may pick out some logical term if that term is provided in the discourse context. Like the parse of the VP ellipsis in (17), pronouns as another sort of formula underspecification are construed as projecting a metavariable ($U$, $V$, etc.), too, a placeholder for a formula that requires to be replaced by some selected term from the context.

Consider the processing of the two pronouns in the question-answer pair in (18) below (Note that in speech Chinese does not distinguish masculine from feminine, and the gender of a referent is solely determined via the discourse context). Consider the parsing of (B1), one of the two alternative answers to A’s question.

(18) A: *Lisi xihuan Lanlan ma?*

Lisi like Lanlan Q
‘Does Lisi like Lanlan’?

B1: *Ta (hen) xihuan ta.*

he very like her
‘He likes her (very much).’

B2: *(hen) xihuan.*

very like
‘He likes her (very much).’
The subject pronoun *ta* ‘he’ and the object pronoun *ta* ‘she’ in (B1), are identified as *Lisi* and *Lanlan* respectively. The anaphoric resolution of this sort is sorely dependent on the discourse context, rather than otherwise. Technically, the two pronouns can be taken as projecting two metavariables, *U* and *V*, respectively. Construed in the given context, substitution will determine that the two metavariables can only pick out the logical term *Fo(Lisi’)* and *Fo(Lanlan’)* established in A’s utterance.

As has been illustrated above, within a parsing-based framework like DS, both representations of content and context are defined dynamically and structurally.

### 3.3 Structural underspecification

Apart from the two sorts of underspecification which are encoded by requirements to construct nodes of certain types and to identify the formula value of a node respectively, a third sort of underspecification is that of a tree relation, associated with a requirement to identify where in a tree a node should be fixed. Such positional underspecification can be used to account for long-distance dependency effects which are analyzed as involving an initially unfixed node whose position in the emergent tree structure is fixed at some later state of the parsing process. There is a computational rule called *ADJUNCTION* that achieves this effect, defining a transition from an initial tree of *?Ty(t)* with only a single node to a tree that contains in addition a node carrying a treenode address, *?∃x.Tn(x)*, a requirement to identify a fixed address within an unfolding propositional structure. The effect of this construction rule is illustrated in Figure 6 below.

**Figure 6. Parsing a left dislocated string**

\[
Tn(n),?Ty(t)\xrightarrow{} Tn(n),?Ty(t)
\]

\[
(\uparrow *)Tn(n),?Ty(e),?∃x.Tn(x)\]

The rule of *ADJUNCTION* finds its best application in the characterization of left dislocation structures, since it captures the intuition that the left-peripheral expression requires a fixed position for the overall structure to be interpreted. Consider the short dialogue in (19) below, where (B1) can be seen as a ‘canonical’ answer and (B2) and (B3) are two alternative answers.

(19) A: *Ni xihuan yuyanxue kecheng ma?*  
‘Do you like the linguistics courses?’

B1: *Wo xihuan jufaxue, bu xihuan yuyongxue.*  
‘I like syntax, but not pragmatics.’

B2: *Jufaxue wo xihuan, yuyongxue (wo) bu xihuan.*
As discussed in the literature (see, e.g., Wu, 2005; Cann & Wu, 2011), the three utterances in (19B) illustrate to some degree the flexibility of Chinese syntax (I will discuss this in more detail in Section 4). As far as clause-initial expressions such as \textit{jufaxue} ‘syntax’ and \textit{yuyongxue} ‘pragmatics’ in (B2) are concerned, they usually have a focus interpretation if there is no pause indicated in the discourse.\footnote{Thus, the initial expression \textit{jufaxue} ‘syntax’ of the first clause in (B2) can be construed as projecting an unfixed node, which is to be fixed later in the propositional tree projected by the clause \textit{wo xihuan} ‘I like’.

As can be seen in Figure 7, at the point when all words in the string have been processed, there remain two outstanding requirements: a requirement to find a fixed position and a requirement to construct a node of Ty(e), as indicated by the pointer. In such an environment, a process of MERGE can take place which unifies the information on the unfixed node with that on the internal argument node, as shown by the dashed arrow. Ultimately, completion of parsing the utterance derives a full proposition, \(\text{Fo}(\text{Xihuan}(t,x,\text{Jufaxue}(x))(\text{Shuohuaren}'))\) (note that \textit{shuohuaren} means ‘speaker’), which is identical to that for the canonical sentence \textit{wo xihuan jufaxue} ‘I like syntax’. Although the output tree for the left dislocation structure is identical to that for the canonical structure, the informational differences between them are captured in the parsing process: the left-dislocated object projects a term that provides an update to a propositional structure, thus creating a type of focus effects (see Kempson et al., 2006; Marten, 2007).

Figure 7. Parsing \textit{Jufaxue wo xihuan} ‘Syntax I like’

\[
\begin{array}{c}
Tn(0), Ty(t) \\
(\uparrow \ast)Tn(0), Ty(e), Fo(t,x,\text{Jufaxue}(x)) \\
Ty(e), Fo(\text{Shuohuaren}') \\
, Ty(e \rightarrow t), Fo(\text{Xihuan}') \\
\end{array}
\]

Notice how this modelling of natural language structure replaces the static configurational approach: concepts such as \(c\)-command defined over a fixed structure are replaced by the dynamic concept of left to right processing. That is, with the added dimension of tree growth following a left-right sequence of words, not all explanations need to be provided in the form of hierarchical relationships between fixed elements in a structure.
4. A Dynamic Syntax Account

Having introduced the basic machinery for analyzing simple clauses from a dynamic perspective, we are in a position to provide an account of the verbal underspecification phenomenon displayed in sentences like (1) and (2). One of the central issues of tackling verbal underspecification is, as mentioned in Section 2, how to characterize the predicate argument structure (both canonical and non-canonical) associated with relevant verbs. To tackle this issue from a dynamic, parsing-based perspective, a few words about native speakers’ intuition about the interpretation of verbs are in order.

Over the past six decades, it has been generally agreed among Chinese grammarians (see, e.g., Gao, 1948; Wang, 1954; Chao, 1968) that it would be rather hard to determine the transitivity of verbs in Chinese. Based on a comprehensive discussion of the usages of Chinese verbs, Gao (1948/2011, pp. 213-214) goes as far as to claim that “no clear-cut distinction can be made between transitive verbs and intransitive ones in Chinese”, for most of them can be used interchangeably in terms of transitivity. Wang (1954), another authoritative grammarian, claims further that one cannot determine the transitivity of Chinese verbs by means of the criteria used for determining the transitivity of verbs in other languages. Due to the lack of inflectional morphology in Chinese (note that Chinese has no prefixes nor suffixes nor number markers nor case markers nor agreement markers nor tense markers), there lies a possibility that such a language tends to take advantage of this central property and enjoy a considerable freedom in its grammatical system. As far as syntactic configuration and semantic composition are concerned, Chinese verbs in general enjoy a higher degree of flexibility than their English counterparts.8

The flexibility of using Chinese (including its verbs) has engendered a lot of controversy over the issue concerning the basic structure of this language. Some linguists (e.g., Li & Thompson, 1975, 1981) assert that Chinese is undergoing a change from SVO towards SOV, whereas others (e.g., Sun & Givón, 1985) claim that Chinese is, generally speaking, a typical SVO language like English. Taking all the structural properties of Chinese sentences into account, some researchers (e.g., Wu, 2005) point out that Chinese does not have a rigid SVO word order like English, but does have a rigid SV construction at its very heart, with the remaining elements freely ordered with respect to this according to the communicative contexts, as already illustrated by (19) in Section 3.

As a consequence, the flexibility of using verbs in Chinese renders the predicate argument structure hardly predicatable during the course of communication, suggesting that at the time of processing a verb, hearers would have to adopt a ‘wait-and-see’ strategy: that is, they would wait until the whole sentence is uttered and see if the heard string should make sense to them, based on their knowledge of the particular language being used. As will be shown shortly, this kind of intuition should and can be dealt with in the dynamic approach.

In the first place, let us consider the parse of those sentences in (1) and see how the argument structures associated with this common verb can be characterized. The analysis of (1a) women shui le ‘we went to bed’, a canonical intransitive construction, begins as
usual with a requirement to construct a propositional structure. The standard introduction rule can then apply to introduce a full propositional template. This allows the parse of the subject NP *women* ‘we’, which as a first-person pronoun projects a metavariable $U$ whose semantic value is identified with *shuohuaren* ‘speakers’, as shown in the tree in Figure 8.

Figure 8. Parsing *Women*

```
?Ty(t)
```

```
Ty(e), Fo(Shuohuaren') ?Ty(e→t)Ø
```

Subsequent to the construction of the subject node, the pointer then moves to the functor node, requiring it to be developed, as can be seen in Figure 8. The verb *shui* ‘sleep’ is in turn processed. Given the indeterminacy of verbs’ argument structure, we need to find a way to sort out the problem of their type specification. Based on the above discussion of the structural properties of Chinese, its verbs in particular, we can, following Marten (2002), treat Chinese verbs as underspecified as to type, characterized as in (20) below by means of the Kleene star operation, whose specification is fixed only by *the structural context* in which the potential arguments are introduced.

(20) \((e^*→t)\)

The basic idea is that both arguments and adjuncts can be syntactically optional (as shown in Chinese examples (1) and (2) and English examples (6) and (7)), and verbs can thus be analyzed as underspecified in that they structurally underspecify the number of $Ty(e)$ expressions, taken to include both semantically selected NPs and semantically unselected yet syntactically expressed NPs, the latter of which can be treated as optional arguments. With the introduction of optional arguments, the concept addressed by the lexical verb is pragmatically enriched. Therefore, the incremental interpretation of a verb phrase can be seen as a case of enriched semantic composition, a compositional process that may be subject to pragmatic reasoning (see Jackendoff, 1997, 2002; Zhang, 2005).

The formulation in (20) explicitly encodes the likelihood of adding $Ty(e)$ expressions optionally. The starred $e$ could minimally stand for zero, as in the case of weather verbs. It follows from this formulation that after the verbal underspecification is resolved, the starred type of predicates reduces to an ordinary type specification which has already been employed in the DS system, e.g. $Ty(t), Ty(e→t), Ty(e→(e→t)), Ty(e→(e→(e→t)))$, as will be demonstrated shortly.

Having sorted out the problem with the analysis of verbs with respect to the type assignment, let us return to the parse of the sentence under discussion. In the light of the above discussion, verbs like *shui* ‘sleep’, which are usually construed as intransitive out of context, can be temporarily described as $Ty(e^*→(e→t))$, meaning that minimally these intransitive verbs need one argument to form a proposition. To capture the intuition that
at the time of processing verbs hearers usually take a ‘wait-and-see’ strategy, we treat the verb *shui* as projecting a locally unfixed node, by adapting the rule of *ADJUNCTION* introduced in the preceding section. Its final position in the tree should be identified after all the following expressions (arguments and argument-like adjuncts) are introduced into the tree. The lexical entry for *shui* ‘sleep’ can thus be given in (21) below, and the parse state involving the verb can be illustrated by the dotted branch in Figure 9.

(21) Lexical entry for *shui* ‘sleep’

IF $\text{Ty}(e \rightarrow t)$
THEN make($\downarrow*$), put (Fo(Shuai’), $\text{Ty}(e^* \rightarrow (e \rightarrow t))$), go($\uparrow*$, $\text{Ty}(e \rightarrow t)$)
ELSE abort

Figure 9. Parsing *women shui*

If there should be no lexical input after the parse of the verb *shui* ‘sleep’, the type underspecification of this verb would be resolved, that is, it is a one-place predicate, by merging the unfixed node with the open predicate node. This is in fact the derivation of (1a) *women shui le*. The tree can then be completed, which will yield a well-formed propositional form $\text{Fo}(\text{shui’}(\text{Shuohuaren’}))$. In the case of (1b-d), the tree would have to be expanded to allow the parse of the postverbal expressions. Consider the parse of (1b) *Women shui shafa* ‘We sleep sofa’, which is a particular type of construction as discussed in the preceding sections and where the verb *shui* seems to be used transitively. Subsequent to the parse of the verb, which results in the projection of the unfixed predicate node, the pointer moves back to the one-place predicate node. The introduction rule can apply again to introduce a pair of nodes, with one requiring the $\text{Ty}(e)$ expression and the other a two-place predicate. The postverbal NP *shafa* ‘sofa’ can then be processed. As a $\text{Ty}(e)$ expression, it satisfies the requirement on the internal argument node, as shown in Figure 10.

Figure 10. Parsing (1b) *women shui shafa*
Since there is no lexical input subsequent to the parse of *shafa* ‘sofa’, the unfixed node projected by the verb *shui* ‘sleep’ then can merge with the two-place predicate node, meeting the requirements on both nodes: the former needs a fixed node and the latter a logical formula. Completion of the tree in Figure 10 gives rise to a propositional form $Fo(\theta_{Shui}(c,x),Shafa(x))(Shouhuaren')$, which denotes the speakers’ sleeping state at a certain period of time, a state which involves two participants, namely *women* ‘we’ and *shafa* ‘sofa’. Compared with *mian* ‘noodle’ in (2b) *Women chi mian* ‘we eat noodles’, which is a selected internal argument or logical object of the verb *chi* ‘eat’, the postverbal locative NP *shafa* ‘sofa’ in (1b) *Women shui shafa* (lit. ‘we sleep sofa’) appears to be an unselected internal argument from the generative perspective, especially viewed from the principles such as the 0-Criterion and the Projection Principle (Chomsky, 1981) and Uniformity of Theta Assignment Hypothesis (Baker, 1988). As Zhang (2005) points out from a constructionist perspective, unselected arguments are licensed in terms of an enriched view of conceptual combination and pragmatic inferences, which suggests that no abstract syntactic mechanisms need to be invoked for such phenomena.

In what follows, I examine some complex data as sentences (1c-d) and (2c-d) and see if they can be accommodated by the proposed Dynamic Syntax account, under which verbs are taken as projecting an unfixed node which would be ultimately fixed till all $Ty(e)$ expressions are processed. Consider (1c) and (2c) first, which contain the expletive use of the pronominal form *ta* ‘it’. From a constructionist perspective (see Goldberg, 1995, 2006), sentences as such should be viewed as a specialized construction, because it appears to be a conventionalized pairing of form and function: the occurrence of *ta*, albeit devoid of lexical content, produces the strength-of-feelings effect, as mentioned in Section 2. Although it is an expletive pronoun, I follow Wu and Matthews (2010) and still treat it as a $Ty(e)$ expression, as all noun phrases in the DS system are taken to project a term. Figure 11 shows the parse state subsequent to the parse of the verb *shui* ‘sleep’ and the non-referential *ta*.

**Figure 11. Parsing women shui ta**

As can be seen in Figure 11, *ta* projects a metavariable $V$ as an interim value, whose value can be instantiated by a term established in previous context, or a term projected by a postverbal expression. In the context of (1c) *Women shui ta yige xingqi* ‘let us sleep as long as a week’, for example, there is no term that can serve as a substituend for the
metavariable \( V \), so that there is only one possibility of instantiating its value, namely by the parse of a post-\( ta \) expression, the indefinite NP \( yige xingqi \) ‘a week’. Technically, a node of \( Ty(e) \) can be created by a second step of applying the computational rule of INTRODUCTION, which allows the parse of the post-\( ta \) indefinite temporal expression \( yige xingqi \) ‘a week’. This \( Ty(e) \) node annotated with the formula value \( (e, x, Xingqi'(x)) \) then overlays the \( Ty(e) \) node already constructed, namely the one decorated by a metavariable \( V \), as shown in Figure 12.

Figure 12. Parsing \( women shui ta yige xingqi \) (lit. ‘we sleep it one week’)

\[
\begin{align*}
?Ty(t) \\
Ty(e), Fo(Shuojuaren') & ?Ty(e \rightarrow t) \\
Ty(e), Fo(V) & ?Ty(e \rightarrow (e \rightarrow t)) \\
\uparrow & Ty(e^* \rightarrow (e \rightarrow t)), Fo(Shui'), \exists x Tn(x) \\
Ty(e), Fo(e, x, Xingqi'(x)) & 
\end{align*}
\]

Here, a question that may arise is, is there any justification for associating the expletive use of \( ta \) with the following indefinite expression? When discussing the distributional properties of \( ta \) ‘it’ (i.e. it occurs between a verb and a numeral indefinite), we have pointed out in Section 2 that the Chinese expletive requires an associate in the particular construction containing it, namely the indefinite expression following it, as already illustrated by (13), repeated here as (22) below.

(22) a. \( women chi ta shiwan mian \).
   \begin{itemize}
   \item we eat it ten-bowl noodle
   \end{itemize}
   ‘Let us eat ten bowls of noodles!’

b. \( women chi ta yige yue mian \).
   \begin{itemize}
   \item we eat it one-CL month noodle
   \end{itemize}
   ‘Let us eat noodles for a month!’

c. *\( women chi ta mian \).
   \begin{itemize}
   \item we eat it noodle
   \end{itemize}
   ‘Let us eat noodles!’

d. \( it \) was possible that Peter won the prize.

The kind of association between the expletive use of \( ta \) and the post-\( ta \) indefinite expression is to some extent analogous to the kind of association between the expletive use of \( it \) and a post-\( it \) clausal string in the English construction (22d) above (see Cann et al., 2005, pp. 194-198 for the analysis of sentence extraposition). Therefore, there is justification for substituting the metavariable \( V \) projected by the expletive \( ta \) with the term
projected by the following indefinite NP *yige xingqi* ‘a week’. In the case of (2c) *Women chi ta shiwan mian* (lit. ‘we eat it ten-bowl noodle’), it is the term $F(o(\lambda x, x \in ^v \cap mian \land MEAS(x) = \langle 10, wan \rangle)$ projected by the numeral phrase *shiwan mian* ‘ten-bowl noodle’ that replaces the metavariable projected by the expletive pronoun.$^9$

Let us come back to the parse of (1c). Since there is no lexical input following the parse of the post-*ta* numeral phrase, the unfixed node projected by the verb *shui* ‘sleep’ can then merge with the two-place predicate node, as has already been seen above. Completion of the tree yields a well-formed propositional form $F(o(Shui'(e, x, Xingqi'(x)))(Shouhuaren'))$ as shown in Figure 13, which is exactly the same as the output of parsing a canonical sentence *Women shui yige xingqi* (lit. ‘we sleep one week’), namely the *ta*-less counterpart of (1c). As for (2c) *Women chi ta shiwan mian* (lit. ‘we eat it ten bowls of noodles’), it is parsed in exactly the same fashion. Here we may have a glimpse of how the emphatic effect produced by the expletive pronoun is captured through the dynamic, parsing analysis: compared with their *ta*-less counterparts, the occurrence of an expletive pronoun in sentences such as (1c) and (2c) appears to require additional processing effort, that is, its occurrence forces the hearer to search for a possible substituend. The search task is a rather difficult one, for the identification of the expletive *ta*’s associate (e.g. *yige xingqi* ‘a week’ in (1c) and *shiwan mian* ‘ten bowls of noodles in (2c)) seems more time-consuming than the identification of the referential *ta*’s referent (e.g. *Wangwu shui le, bie darao ta* ‘Wangwu slept. Don’t disturb him’). Hence arises the sort of strength-of-feeling effect, as discussed in Section 2.

Figure 13. Final result of parsing *women shui ta yige xingqi* (lit. ‘we sleep it one week’)

\[
\begin{align*}
Ty(t), F(o(Shui'(e, x, Xingqi'(x)))(Shouhuaren')) \\
Ty(e), F(o(Shouhuaren')) \\
Ty(e \rightarrow t), F(o(Shui'(e, x, Xingqi'(x)))) \\
Ty(e), F(o(e, x, Xingqi'(x))) \\
Ty(e \rightarrow (e \rightarrow t)), F(o(Shui'))
\end{align*}
\]

With the successful characterization of (1c) and (2c), we should have no difficulty applying the dynamic analysis to sentences such as (1d) and (2d), repeated as (23a-b).

(23) a. *Women shui le yige xingqi shafa.*
    we sleep PERF one-CL week sofa
    ‘We slept on the sofa for a week.’

b. *Women chi guo yige yue mian.*
    we eat EXP one-CL month noodle
    ‘We ate noodles for a month.’

The whole process of parsing (23a), for instance, can be characterized as in Fig. 14, where
the verb *shui* ‘sleep’ initially projects an unfixed node and then merges with the three-place predicate node, subsequent to the parse of the object NP *shafa* ‘sofa’.

Figure 14. Parsing *Women shui le yige xingqi shafa* (lit. ‘we sleep one week sofa’)

\[
\begin{array}{c}
\text{Ty}(e), \text{Fo}(\text{Shuohuaren})' \quad \text{?Ty}(e \rightarrow t) \\
\text{Ty}(e), \text{Fo}(\varepsilon, x, \text{Xingqi}(x)) \quad \text{?Ty}(e \rightarrow (e \rightarrow t)) \\
\text{Ty}(e), \text{Fo}(\varepsilon, y, \text{Shafa}(y)) \quad \text{?Ty}(e \rightarrow (e \rightarrow (e \rightarrow t)))^\diamond \\
\end{array}
\]

Completion of the tree in Figure 14 will yield a well-formed propositional form \(\text{Fo}(\text{Shui}(\varepsilon, y, \text{Shafa}(y))(\varepsilon, x, \text{Xingqi}(x))(\text{Shuohuaren}))\). As for (2d) *Women chi guo yige yue mian* (lit. ‘we ate a month noodles’), it is once again parsed in the same fashion, which yields a well-formed propositional formula \(\text{Fo}(\text{Chi}(\varepsilon, y, \text{Mian}(y))(\varepsilon, x, \text{Yue}(x))(\text{Shuohuaren}))\). A question, as a reviewer raises, is whether the reverse orderings of the postverbal expressions in (23a-b) would lead to distinct logical structures. Different orderings of argument expressions and argument-like adjunct expressions, as shown below in (24), would give rise to seemingly distinct yet totally equivalent logical structures.

(24) a. *Women shui le shafa yige xingqi.*  
   we sleep PERF sofa one-CL week  
   ‘We slept on the sofa for a week.’  

b. *Women chi guo mian yige yue.*  
   we eat EXP noodle one-CL month  
   ‘We ate noodles for a month.’

As has already been discussed in Tang (1994) (see Section 2), both orderings, namely Verb-Object-Temporal/Locative Expressions and Verb-Temporal/Locative Expressions-Object, are in general acceptable to native speakers of Mandarin Chinese, as already illustrated by the two examples in (10), repeated here as (25) below.

   I teach Chinese thirty year PERF  
   ‘I have taught Chinese for thirty years.’  

b. *Wo jiao le sanshi nian zhongwen.*  
   I teach PERF thirty year Chinese  
   ‘I have taught Chinese for thirty years.’
Sentences such as (24)-(25) prove to a large extent the flexibility of using the Chinese languages and the feasibility of adopting an incremental parsing-based analysis of strings to characterize cases of verbal underspecification.

5. Conclusion

Verbal underspecification is a problematic linguistic phenomenon, since it demonstrates the complex and subtle interaction between lexical, structural and pragmatic information during the syntactic process. Within the DS framework which allows the interaction between lexical, structural and pragmatic information during the parsing process, I have successfully characterized the verbal underspecification in Chinese, and have demonstrated that a parsing-based dynamic approach can offer a more adequate explanation of the non-canonical argument structure phenomenon than syntactocentric approaches. Specifically, I have shown that just like semantically selected expressions, semantically unselected yet syntactically expressed expressions contribute to the semantic composition that no abstract syntactic mechanisms need to be invoked for.

The dynamic account proposed here is consistent with the enriched view of conceptual combination in the sense that it takes seriously the interaction of grammar and context and directly reflects the incrementality of semantic interpretation relative to context. What is distinct about the Dynamic Syntax approach adopted in this paper is that it not only can provide a formal tool to the characterization of the structural properties of language (e.g., the predicate argument structure associated with verbs), but can provide an account for the functional properties associated with some particular grammatical construction (e.g. the strength-of-feelings effect expressed by expletive ta construction).

With the successful characterization of the verbal underspecification phenomenon, I have shown how a direct mapping between syntactic structures and semantic representations is made possible within a parsing-oriented grammar formalism, which defines both representations of content and context dynamically and structurally.

Acknowledgement

The author gratefully acknowledges funding support from the National Social Science Foundation of China (No.12BYY091).

Notes

1 The third-person pronoun ta ‘it’ in sentences like (1c) and (2c) is used non-referentially, and is therefore called a dummy or expletive object (see, among others, Chao, 1968; Zhu, 1982; Ma, 1983; Lin, 1994; Yuan 2003). Interpretively, sentences such as (1c) and (2c), which are usually a volitional, have some special expressive effect, precisely a strength-of-feeling effect (see Chao, 1968; Iljic, 1987; Yuan, 2003).

2 Abbreviations used in this paper are: ACC: accusative; CL: classifier; DEC: declarative; EXP: experiential aspect marker; NOM: nominative; PAR: particle; PERF: perfective aspect marker;
PST: past tense.

3 It is worth noting that there are a considerable number of verbs in Chinese that behave in similar fashion. In addition, the patterns exhibited in (1c-d) and (2c-d) are very popular in everyday conversation.

4 Trees are representations of content with no reflection of linear order. In DS, functor nodes are placed on the right and argument nodes on the left in the tree displays.

5 Tns(PRES) at the top node represents the present tense information, following the practice of Kempson et al. (2001) and Cann et al. (2005).

6 In the tree of Figure 4 and other figures, I use the iota operator (ɩ) to represent the semantic value of yuyanxue ‘linguistics’, on the assumption that the speaker intends this word to mean a specific kind of linguistics in the utterance context.

7 Jufaxue ‘syntax’ and yuyongxue ‘pragmatics’ in (B3) are also said to have focus interpretation (see Huang et al., 2009). In addition, sentence-initial constituents in Chinese have a topic interpretation if they are followed by a particle or a pause, as in the dialogue below:

A: Ni xihuan yuyanxue ma?
   you like linguistics Q
   ‘Do you like linguistics?’

B: Yuyanxue ɑ, wo haisuan xihuan.
   linguistics Particle  I quite like
   As for Linguistics, I quite like it.’

8 This can best be illustrated by two well-studied phenomena in Chinese, the so-called [Vt + Non-patient Object] and [Vi + Object] configurations, which are highly productive. Take chi ‘eat’ as an example. It seems that this verb can be followed by various kinds of NPs, e.g. chi shitang ‘canteen’/kuaizi ‘chopsticks’/gongkuan ‘public funds’/fangzu ‘rental’/fumu ‘parents’/shouyi ‘workmanship’, which mean ‘eat in the canteen’, ‘eat with chopsticks’, ‘embezzle public funds’, ‘live on rentals’ and ‘(still) get fed by parents’ and ‘live on (one’s) workmanship’, respectively. Based on their search in the corpus of CCL (Centre for Chinese Linguistics, Peking University), possibly the largest corpus of its kind, Li and Wu (2014) found that there are 2,459 such non-canonical expressions out of the 10,000 [chi ‘eat’+NP] samples, taking up a percentage of 24.59%. According to the ERP study of Liu et al. (2013), though all of these non-canonical expressions are acceptable to experimental subjects, the interpretation of some of them would be subject to pragmatic reasoning, especially if these expressions are less familiar.

9 Here I follow Li (2013)’s analysis of mensural classifiers in Chinese, in which mensural classifiers such as ping ‘bottle’ and wan ‘bowl’ are construed as having a measure function $\lambda n x. MEAS(x) = <n, U>$ of type $<d, t>$ and a MEAS head combines with a numeral to give a predicate of type $<d, t>$.

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