Reverse Long-distance Dependency and Functional Uncertainty-The Interpretation of Mandarin Questions

Chu-Ren Huang
Academia Sinica

Mandarin Chinese WH-questions exhibit two syntactically interesting characteristics. First, WH-words that bear interrogative information always occur in situ.Second, in spite the above fact, I find that Mandarin WH-questions, with bounded WH-words, share the grammatical behaviors common to questions with unbounded and dislocated WH-words in other languages.Hence,intuitively,an account of Mandarin WH-questions should involve mechanisms for unbounded dependencies but, crucially, involve no unbounded syntactic manipulation. Accordingly, Ipropose an interpretative mechanism for Mandarin WH-questions based on the mechanism of Functional Uncertainty in LFG (Kaplan and Zaenen 1989, and Dalrymple 1990).

Ⅰ. Introduction

WH-questions represent the classical case of long-distance dependencies in English and many other languages, where a WH-word is 'fronted' from its canonical within-clause position. The study of long-distance dependencies is what motivated the postulation of COMP-to-COMP movements in transformational grammar (TG). The Government and Binding (GB) theory inherits the movement account and modifies it in terms of principles (Move WH) and parameters (conditions on landing sites and extraction sites etc.). WH-questions in Mandarin Chinese, however, involve no fronting of the WH-word that would justify a movement account,. J. Huang (1982) gives credibility to the postulation of WH-movements as a universal by showing that postulating abstract WH movements at Logical Form (LF) explains many syntactic behaviors of Mandarin Chinese WH-questions. This is a theory where both the accounts of surface long-distance dependencies and the interpretation of interrogative information rely on movements.

The transformational theories notwithstanding, it has never been clear that the accounts of long-distance dependencies rely on the postulation of movements. In fact, non-transformational theories have been rather successful in accounting for long-distance dependencies.[1] Moreover, there are recent propositions which do not involve movements and yet can still account for claimed overt long-distance dependency relations. These proposals chanllenge J. Huang's (1982) account of treating dependencies with no overt displacements as involving abstract movements.

The Lexical-Functional Grammar (LFG) theory of Functional Uncertainty, put forward in Kaplan and Zaenen (1989), is one of such proposals. The mechanisms of Functional Uncertainty

successfully captures dependency relations in terms of possible 'paths' between a 'displaced' grammatical function and its governing predicate. It has been applied to Mandarin constructions with overt long-distance dependencies, such as topicalization (Chen 1989, Huang 1992) and relative clauses (Hu 1989). These studies, like the earlier work of J. Huang (1982) and Xu and Langendoen (1985), offers basically satisfactory accounts of the Mandarin data.[2] It can be argued that a movement account deals directly with the nature of the unbounded dependencies while a surface-based approach deals directly with the in situ syntactic positions. It is therefore interesting to see whether the surface-based approach can also account for Mandarin Chinese WH-questions where unbounded interpretation is required. I will show that revised mechanisms based on the theory of Functional Uncertainty can be used to account for the interpretation of in situ WH question words in Mandarin. In what follows, I will introduce the theory of Functional Uncertainty in Section Ⅱ, discuss relevant Mandarin Chinese data in Section Ⅲ, propose the revised mechanisms of Reverse Functional Uncertainty to formally account for semantic interpretation of interrogative questions in Section Ⅳ, discuss the difference between our analysis and

J. Huang's (1982) in Section V, and briefly sum up the study in Section Ⅵ.

Ⅱ.The Theory of Functional Uncertaintv

The theory of Functional Uncertainty (Kaplan and Zaenen 1989), accounts for long-distance dependencies in terms of dependent relations between a discourse function and a within-clause governed grammatical function. One of the most important claims of this theory is that these dependent relations can always be captured by an uncertainty equation of regular expressions.[3]

The basic idea is that long-distance dependencies are dependencies between functions and cannot be broken down to local dependencies. It is observed that efforts to characterize long-distance dependencies through the mediation of local dependencies, such as COMP to COMP movements in TG or the FOOT feature SLASH in GPSG (Generalized Phrase Structure Grammar, Gazdar et al. 1985), lack concrete evidence for these proposed local dependencies. However, adopting the LFG premise that functions are autonomous, the following rule (la) provides an adequate description of all long-distance dependencies.

(1) a. S' - - > Ω Σ
(↑ DF) = ↓ ↑ = ↓
(↑ DF) = (↑ BODY BOTTOM)

b. S' - - > XP or S' S
(↑ TOPIC) = ↓ ↑ = ↓
(↑ TOPIC) = (↑ {COMP, XCOMP}*(GF-COMP))

(la) is the general rule introducing the uncertainty expression, while (lb) is the language-specific instance for English topicaliztation proposed in Kaplan and Zaenen (1989). In l, DF stands for discourse functions, including TOPIC and FOCUS; and GF stands for grammatical functions. In general, a BODY is a grammatical function. The rule (lb) stipulates that, in English long-distance dependency occurs between a TOPIC function and a grammatical function other than COMP (a semantic proposition). Such a dependency is not restricted by distance. However, it is restricted by the requirement that an identifiable path (i.e. BODY) must exist and must consist of any number of two randomly ordered grammatical functions: COMP and XCOMP. In other words, topics in English can be linked to any grammatical function other than COMP as long as all the functions containing that function, other than the matrix, are either COMP or XCOMP.[4]

In this theory, no nodes with null content nor empty categories need to be postulated. Instead, the Extended Coherence Condition enforces the dependent relations between a 'fronted' function, and the within-clause predicate which subcategorizes it. The Extended Coherence Conditi requires a discourse function, such as the TOPIC or the relativized FOCUS, to be governed by a predicate. This condition can only be satisfied by finding a solution to the Functional Uncertainty equation. Take (lb) and the English sentence Marv, Max loves for example. The predicate to love takes as arguments the two grammatical functions SUBJ and OBJ. However, the TOPOIC Marv does not by itself represent any function governed by a predicate. The sentence Max loves, on the other hand, does not contain representation of the OBJ function. This seeming dilemma is solved by identifying the TOPIC Marv as the representation of the OBJ function. Such identification, or unification as defined in Shieber (1986), is conditioned by the uncertainty equation annotated to a TOPIC node in (lb).[5] The particular solution to the uncertainty equation in this sentence is ↑ TOPIC = ↑ COMP OBJ. Thus the TOPIC Marv is linked to the within-clause OBJ function as sanctioned by this equation. In other words, Functional Uncertainty precisely formalizes the conditions under which a discourse function can be linked to a governed but (locally) un-represented function of a predicate. When the conditions are met, i.e. the uncertainty is resolved, the discourse function, such as the TOPIC, will be unified with the un-represented function to satisfy the grammaticality conditions of Functional Uniqueness, Coherence, and Completeness. Cases where the uncertainty relation is not resolved will be ruled out by the same conditions.[6]

I will examine topicalizations in Mandarin Chinese in order to illustrate the application of Functional Uncertainty. The following functional uncertainty schema is proposed and discussed in Chen (1989) and Huang (1992).

(2) S' - - - > XP S
↑ TOPIC = ↓ ↑ = ↓
↑ TOPIC = (↑ {SUBJ, OBJ, RELMOD, COMP, XCOMP}*SUBJ, OBJ })

The uncertainty equation annotated in (2) stipulates that only the two grammatical functions SUBJ and OBJ can be linked and represented by the discourse function TOPIC in Mandarin Chinese. This nicely accounts for the fact that the object of an preposition (OBLique in LFG terms) cannot be ‘ topicalized’ in Mandarin Chinese.[7] Furthermore, the set of BODY stipulates that a TOPIC in Mandarin can be linked through a sequence composed of any number of grammatical functions from the set of SUBJ, OBJ, COMP, XCOMP, and RELMOD (relative clause modifier). This straightforwardly accounts for the phenomenon that was difficult to deal with in TG; namely, the fact that Chinese topicalization violates the well- supported constraints of Sentential Subject Constraint (SSC) and Complex NP Constraint (CNPC) on movements.[8]

(3) zhege wenti, [[ni zheyang huida []] hen deti]
this question you this-way return-answer very gain-body
‘This question, that you replied [] in this way was very appropriate.’

The Mandarin sentence (3) violates Sentential Subject Constraint and is considered anomalous in TG. However, the contrast between Mandarin and the languages which obey Sentential Subject Constraint is straightforwardly predicted in the theory of Functional Uncertainty. The uncertainty equation in (2) captures the fact that Mandarin allows a SUBJ to occur in a dependency path. The languages exhibiting the Sentential Subject island effect, on the other hand, simply do not include the grammatical function SUBJ in the set of BODY. In either case, the linguistic data are predicated by the equation without the stipulation of an additional rule.

(4) zheijian shi, [wo bu zancheng [[ni chuli []] de shiji]]
this-CLASS issue I NEG consent you deal-with DE timing
‘This issue, I do not consent to the timing you [chose to] deal with []’

Similarly, there are cases of clear violation of the Complex NP constraint, such as in (4) This is unexpected in any transformational grammar, However, it is only the natural consequence of including RELMOD as a member of the set of GFs defining a dependency path in Mandarin.

In addition to topicalization, Functional Uncertainty can also account for Mandarin relative clauses. The following rule is proposed in Hu (1989) and revised in Huang et al. (1990).

(5) NP - - > S NP
↑ RELMOD = ↓ ↑ = ↓
↑ TOPIC = (↓ {COMP, XCMP}*{SUBJ, OBJ})
↑ TOPIC PRED = ‘PRO’
↑ TOPIC U = +

The equation annotated in (5) stipulates that only SUBJ and OBJ can be at the BOTTOM of a long-distance dependency, as in topic structures. However, the path leading to the gap in a relative clause is different from that of a topic structure. It may only be composed of either COMPs or XCOMPs and cannot be composed of other grammatical functions.

In this section, we have introduced the uncertainty rules accounting for unbounded surface dependencies, including topic structures and relative clauses. I will next turn to a

Ⅲ. Mandarin Question:

The interpretation of embedded interrogative information

Typical Mandarin WH-questions are marked by in situ question words and involve no change from a canonical declarative sentence. These question words encode the interrogative information, and can often be interpreted as having a scope at an unboundedly higher clausal level. In other words, even though a question word is represented at an embedded level and governed by a local predicated, it may also represent the interrogative information and focus at the sentential or any supre-ordinating clausal level. Thus, these interrogative constructions represent a different kind of long-distance dependency where a locally governed phrase is interpreted as a higher level.

(6) Zhangsan xiwang Lisi gen shei xue yuyanxue?
Zhangsan hop Lisi GEN(with) who learn linguistics
'With whom does Zhangsan hope that Lisi will study linguistics?'

The Mandarin sentence (6) questions the identity of the person whom Zhangshei 'who' is an object of a preposition in a subordinate clause, it encodes the interrogative focus of the matrix sentence and hence has to be a piece of information available at the matrix level. Thus, in Mandarin questions , with in situ question words, entail a long-distance dependency between a question word and the level where the interrogative information is interpreted (often at the matrix level, or at an intermediate level if required by a governing predicate).

The case in English is just the opposite. A WH-word in a WH-question has to occur in the sentence-initial position and the WH-word is locally interpreted as bearing the interrogative focus of the sentence, However, the role and grammatical relation of this element are not encoded at that position. They are inferred from the absence of a certain required within-clause element. This is the familiar kind of long-distance dependency traditionally accounted for by transformation (e.g. Move-WH). Assuming that interrogative constructions in different languages share the same semantics and obey the same locality condition adopted in most current syntactic theories, the question to ask is whether the two kinds of dependencies can be accounted for with the same mechanism. The two candidates for such a uniform mechanism discussed here are the movement account of J. Huang (1982) and a Functional Uncertainty account.

The most salient way to show motivation for a movement account is to demonstrate that sentences which involve no over dislocation somehow obey constraints on movements. However, it is easy to show that Chinese WH-words are not subject to island constraints in general. This is expected for island constraints are conditions on movements.

(7) (= J. Huang 1982.381(36))[9]
[[shei yao mai de] shu] zui gui?
who want buy DE book most expensive
'Who is it that wants to buy the most expensive books?'

(8) [xueshengmen yao zeme zuo] cai fuhe xuexiao de yaoqiu?
students must how do such-that match school DE requirement
'How could the students act to meet school requirements?'

Mandarin WH-words, like topics, violates both CNPC and SSC if they are interpreted as undergoing movements. (7) would violate CNPC and (8) would violate SSC. The above facts would remain anomalous to any movement account.

Despite the above apparent counterexamples, including the one (7) he himself observes, J. Huang (1982) still argues for an abstract movement account of Mandarin Chinese WH-questions. His proposal postulates that Mandarin (and possibly other languages with in situ WH-words involve abstract movements at LF and that abstract LF movements do not obey Subjacency (or other conditions on movements). This accounts for violations of island conditions such as the above. However, he also has to make exception to this exceptional case of movement without movement effects. he argues that at least two WH-words weisheme 'why' and zeme 'how,' are exempt from the general exemption from movement conditions, meaning that these two WH-words do obey movement condisitions and show island effects. he speculates that since the two WH-words are non-objectual (i.e. not NPs) and are probably abstract APs or PPSs.

This piece of evidence turns out to be d double-edged sword. On one hand, the two words are crucial in his account since they are the only Mandarin WH-words which demonstrate movements effects. On the other hand, they re exception to the general exemption to island conditions of Mandarin WH-words and need independent tipulation and motivation. Even though the two postulations enable him to maintain an account coherent with the established movement theories, they also obliterate the observable differences between languages employing dislocated any in situ WH-words. A even more serious problem is to account for sentences such as (8), where I clearly demonstrate that the interpretation of zeme violates island constraints. This counterexemplifies J. Huang's (1982) claim that the two WH-words offer unequivocal evidence for movements. Thus all mandarin WH-word are observed to violate movement conditions and the abstract movement account does not consistently predict the behaviors of WH-words.

Bear in mind that J. Huang's (1982) movement account is motivated by both seeming island effects and quantifier-like behaviors. Even though seeming island effects are cited to suggest and support a movement account, all such data except for those involving either zeme or weisheme are later attributed to the Specificity Condition in J. Huang (1982).[10] The fact that zeme and weisheme do violate island conditions like other WH-words, discussed in this paper and in Xu (1990), takes away the only direct evidence for movement of WH-questions would involve Thus, the only valid argument for a movement account of Mandarin WH-questions would involve the quantifier-like behaviors of question element, such as scopal ambiquity.[11]

It will be argued in the next section that quantifier-like WH-words need not be accounted for in terms of movements. A surface-based non-movement theory encodes the relevant grammatical information onto an embedded WH-word. The more complicated part of the theory involves the prediction of the level where the lexically encoded interrogative information is which resolves an uncertainty by allowing a path of non-determinant length into the clause. It calls for a reverse kind of uncertainty formalism.

Ⅵ. Reversed Functional Uncertainty:

A formal account of semantic interpretation

A recent addition to the theory of Functional Uncertainty and the LFG account of long-distance dependencies is Reverse (inside-out) Functional Uncertainty. Halvorsen and Kaplan (1988) introduce the idea to account for the scopes of quantifier phrases, and Dalrymple (1990) extends the application to include interpretative constraints of anaphora.

Dalrymple et al. (in preparation) follow the LFG convention (e.g. Kaplan and Bresnan 1982) of marking the f-structure representing the mother node with an up arrow ↑ in their formulation of Reverse Functional Uncertainty. The up arrow will be suffixed to a uncertainty path which will also be composed of a BODY and a BOTTOM. In Dalrymple (1990), the path of GFs is called DomainPath and the BOTTOM is simply represented as a GF. We will take her account of Mandarin reflexive pronoun and an illustrative example (Dalrymple 1990.157-159).

(9) $[((\text{COMP SUBJ}\uparrow)\ \text{SUBJ})\ \sigma = \uparrow\ \sigma]$

Recall that the reverse Functional Uncertainty is only used in semantic interpretation, including resolution of the references of anaphora. This is why the above equation is annotated with the interpretive function σ on both side of the equation. Attached to an embedded reflexive pronoun, what the equation specifies is that the interpretative of this pronoun is bound to the meaning of the SUBJ of the mother of the COMP function. This interprets the following sentence taken from J. Huang (1982b).

Zhangsan shuo ziji hui lai

Zhangsan say self will come

'Zhangsan$_i$ said that self$_i$ will come.'

b.

$$\begin{bmatrix} \text{PRED} & \text{'say <(}\uparrow\text{ SUBJ), (}\uparrow\text{ COMP)>'} \\ \text{SUBJ} & \text{[PRED 'Zhangsan']} \\ \text{COMP} & \begin{bmatrix} \text{PRED 'come <(}\uparrow\text{ SUBJ)>'} \\ \text{SUBJ [PRED ziji]} \end{bmatrix} \end{bmatrix}$$

In reverse functional uncertainty, the basic format is:

(11) ((DomainPath $\uparrow$) AntecedentFunction) $\sigma = \uparrow \sigma$

where DomainPate = Body Bottom

and AntecedentFunction is a f-sructure attribute (often a GF)

(12) ((**BODY GF** $\uparrow$)QTYPE) = WH

The up arrow ($\uparrow$) in the equations stands for the f-structure where the interrogative information is linguistically represented, and the QTYPE attribute will be the outside-in path as termed in Dalrymple. et. al. (in preparation). BODY, like in normal outside-in uncertainty, represents the iterating part of the path. The linking of the QTYPE attribute to an appropriate f-structure level is a step in semantic interpretation. In other words, the lexically encoded attribute plays a pivotal role in semantically interpreting the sentence as a question and in determining the scope.

The observation is that although the category and the in-clause argument relation of a WH-question or a disjoint question is locally encoded by the interrogative marker (WH-word or A-not-A), two pieces of information must be 'percolated up' to an appropriate level. They are that the sentence is interrogative and that the focus of the interrogative is indicated by the marker. Our claim is that both pieces of information can be encoded with the feature QTYPE. The presence of the attribute indicates interrogation and its value specifies the type of information sought by the question. Thus, the lexically encoded attribute plays a crucial role in semantically interpreting the sentence s a question and in location the interrogative information, but it has no place in determining either the predicate-argument structure of the sentence or the grammatical relation of the constituent.

In addition to the uncertainty equation (9) for WH-words, we have the following equation for disjoint questions in Mandarin. This equation further specifies that the uncertainty path must end with a COMP or XCOMP, reflecting the fact that disjoint questions must be encoded on a clause.

(13) ((**BODY COMP** / **XCOMP** ↑) QTYPE) = DJ

Both (9) and (10) allow the lexically specified information to stipulate that a f-structure at a uncertain higher level is interpreted as the proper type of question.[12] As for the level where the question is interpreted, it is either determined by one of the intervening predicates if it subcategorizes for an interrogative argument, or it can be ambiguous. The possibility of ambiguity accounts for Grimshaw's (1979) observation that predicates select the interrogative types of their complements. Relevant Chinese data are described and discussed in J. Huang (1982), Tang (1984), and Shiu and Huang (1989). With straightforward lexical existential constraints, we can account for the observed data involving a predicate which necessarily selects an interrogative complement (e.g. taolun 'to discuss'), as well as one which cannot take an interrogative complement (e.g. xiwang 'hope'), and one which optionally selects an interrogative complement (e.g. zhidao 'know').

(11) a. xiwang, v. –(↑COMP QTYPE)
b. taolun, v. (↑COMP QTYPE)
c. zhidao, v. ((↑COMP QTYPE))

(12) a. ni-men xiwang shei yingde shijiebei
you(PL) hope who win World-Cup
'Who do you hope will win the World Cup?'
b. ni-men (zai) taolun shei yingde shijiebei
you(PL) PROG discuss who win Word-Cup
'You are discussing who won the World Cup.'
c. ni-men zhidao shei yingde shijiebei
you(PL) know who win World-Cup
'Who do you know won the World Cup?' OR
'You know who won the World Cup.'

(11a) specifies with a negative existential constraint that the COMP of the verb xiwang cannot contain the attribute QTYPE. Hence the complement of that verb can never be interpreted as an indirect question, as in (12a). (11b) stipulates that the attribute QTYPE of the COMP of the verb taolun has to be specified. Hence the complement of that verb is always interpreted as an indirect question, as in (12b). (11c) stipulates that the attribute QTYPE of the COMP of the verb zhidao can be optionally specified. Hence the complement of that verb can be interpreted as either a direct or indirect question, as in (12c). The Reverse Functional Uncertainty on each WH-word encodes exactly the same in formation and allows interpretation at any clausal level. So the

ambiguity of (12c) is aptly represented. The lexical constraining equation of (11a) and (11b), however, each rules out one possibility such that both (12a) and (12b) are unambiguous.

We will not go into the de3tails of our analyses concerning the scope-taking properties of WH-words. Please refer to the studies of scope-taking properties in Mandarin in J. Huang (1982), Tang (1984), Shiu and Huang (1989), and Tsai (1990). But the concept that, unless a certain predicate selects an interrogative complement and forces that interpretation, the interrogation should be allowed to be interpreted at any intermediate level accounts for the fact without further stipulation.

Ⅴ. Comparisons with J. Huang's (1982) Account

J. Huang's (1982) abstract LF movement account, like ours, is an effort to differentiate the (semantic) interpretation procedure of questions in Mandarin from other syntactic relations which involve non-canonical structural positions (i.e. permutations in transformational terms). In his approach, all grammatical relations are taken to be structural and transformational. Semantic interpretations employ the same tree structure and movement mechanisms, with the crucial difference in that the movement has no effect on the actual surface strings and the movements take place at a separate level of representation. Thus, movement at LF is proposed not only for WH-questions but for other scoping relations such as cleft sentences. One obvious drawback of the structural approach is that the resulted LF tree still has to be semantically interpreted and it is yet to be explicated how the interpretation can be done methodologically. On the other hand, the LFG account proposed in this paper make no pretense that semantical interpretations are structural in nature. The Functional Uncertainty account is part of the attested semantic interpretation procedure of the theory, as formal interpretation rules of attributes in f-structures = have both been explicitly articulated in Halvorsen (1983).

In addition to an established semantic interpretation procedure, the Reverse Functional Uncertainty account has two advantages over a movement account. First, the mechanism of Reverse Functional Uncertainty is called for to account for the scope of quantifiers (Halvorsen and Kaplan to appear) and anaphora (Dalrymple et al.). Both are clear cases of semantic interpretation. And we have argued that Mandarin in situ questions should involve semantic interpretation but no syntactic operation. Second, we have shown that two kinds of long-distance dependencies can be accounted for within the theory of Functional Uncertainty with differences only in their directions. On the other hand, we have shown that there is no concrete evidence for an abstract movement account. Assuming that both accounts make identical predictions, invoking Ockham's Razor would exclude movements at an abstract level.

Ⅵ. Concluding Remarks

In this paper we propose to adopt the mechanism of Reverse Functional Uncertainty account for Mandarin WH-questions. We argue that the movement-based account of J. Huang

(1982) fails to offer convincing evidence for the movement of question elements at LF. We suggest that the same range of facts could be accounted for with a surface-based theory of LFG which relies on the lexical encoding of the interrogative information and the uncertainty mechanism to correctly interpret the information. Huang et al. (1990) have adopted the Functional Uncertainty account of Mandarin long-distance dependencies and the algorithm of Kaplan and Maxwell to proposed a parsing algorithm for Functional Uncertainty in Mandarin. We plan to explicate detailed and formalized linguistic analyses of the Mandarin interrogative construction as well as the parsing algorithm in the future.

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NOTES

[1] One of the best-known example is Gazdar's (1981) account of long distance-dependencies in terms of local conditions on the percolation of grammatical features. A similar approach is also adopted in Chen and Huang's (1991) computational linguistic account of Mandarin Chinese.

[2] Each account, however, has its idiosyncrasies. Please see criticisms of earlier accounts in later accounts such as Xu and Langendoen (1985), Liu (1986), Xu (1990), Tsai (1991), and Huang (1992).

[3] In mathematical and computational linguistics, regular expressions define a set of languages more restricted than context-free language. Set-theoretical operations and Kleene stars are the only allowed operations in defining a regular expression. This means that only membership and random iteration can be stipulated. Neither specific order nor number of occurrences of a certain member can be specified with a regular expression. The regular expression constraint allows the resolution of an uncertainty to be determinable in spite of the non-local property of the paths. See Kaplan and Maxwell (1988) and Huang et al. (1990) for further discussions on the formal properties of Functional Uncertainty.

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[5] Merger, instead of unification, is the standard LFG term defined in Kaplan and Bresnan (1982). The theoretical difference between the two terms bear no consequence for the current study. Please see Kaplan (1990) for further discussions.

[6] The Completeness Condition requires that a f-structure contain all the governable grammatical functions specified in the predicate-argument structure. In other words, it requires that all the 'subcategorized' grammatical functions be represented at f-structure level. The Coherence Condition requires that all the functions contained in a f- structure be governed by a local predicate. In other words, it requires that all the 'subcategorizable functions present in a f-structure be governed by a predicate, either through local subcategorization or through control. Lastly, the Functional Uniqueness Condition requires that every function is assigned one and only one value.

[7] The only less than straightforward case involves OBJ2 (i.e. the indirect object in a double object construction). Both Chen (1989) and Huang (1992) opt for the more strict judgement of excluding OBJ2 from the uncertainty equation. But it should be clear from our discussion that the formalism can be easily adapted to account for the more liberal judgement of allowing topic structure with an OBJ2 gap by simply adding the grammatical function to the equation. This illustrates the declarative and monotonic characteristics of the formalism.

[8] Both SUBJ and RELMOD are allowed members of the regular et of BODY in Mandarin Chinese, while they are not in English and many other Indo-European languages. The exclusion of SUBJ explains the Sentential Subject Constraint, while the exclusion of RELMOD (partially) explains the Complex NP Constraint. Please refer to Huang (1992) for more details.

[9] The original free translation is revised to show that this is a question on the identity of the book-buyer. J. Huang's translation was ' Books that who wants to buy are most expensive?'

[10] The condition stipulates that no quantifiers with a specific NP can have a scope wider than the

NP. The condition is attributed to Fiengo and Higginbotham (1981). Xu (1990) later argues that event the data involving zeme and weisheme can be accounted for with a similar semantic condition without postulating abstract LF movements.

[11] In addition to WH-questions, J. Huang (1982) also argues that A-not-A questions exhibit movement effects. The claim is that A-not-A questions obey Subjacency (or the traditional CNPC and SSC).

i) *[[ni mai-bu-mai de] shu] bijial gui?
you buy-NOT-buy DE book more expensive
'*The book that you will buy or will not buy is more expensive?'

But, as Tang (1984) points out, sentences such as i) are independently ruled out because of the selectional restriction of the predicate bijiao gui 'be more expensive.' The predicate bijiao gui must select a non-interrogative argument. Thus i) does not bear any consequence on whether Mandarin A-not-A questions exhibit movement effects or not.

[12] The equation (9) is encoded in the lexical entries of WH-words. As for A-not-A questions, we are assuming that it is encoded through a morpho-lexical process.

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