ASPECTUAL INFLUENCE ON TEMPORAL RELATIONS:
A CASE STUDY OF THE EXPERIENTIAL *GUO* IN MANDARIN[*]

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ABSTRACT

This paper examines how the temporal relation between a clause containing the experiential *guo* and an adjacent clause is determined. Mandarin is a language not morphologically marked for tenses (e.g., Lin 2006), and therefore, tenses cannot help in determining temporal relations in Mandarin. However, Mandarin has a rich aspectual system. This paper argues that the experiential *guo* indirectly influences temporal relations via rhetorical relations by either specifying a default rhetorical relation, or by constraining the circumstances under which a certain rhetorical relation can connect a clause with *guo* to an adjacent clause. This paper also argues that the default rhetorical relation and the constraints are determined by the aspectual properties of the experiential marker. Other information, such as discourse connectors, lexical information, etc., can override the default rhetorical relation indicated by *guo* and specifies a rhetorical relation. Therefore, this paper concludes that in Mandarin aspect markers can indirectly affect temporal relations by means of rhetorical relations, a result consistent with Wu's (2005b) paper on the perfective marker *le* in Mandarin, and Wu's (2007b, 2004) work on the progressive marker *zai* and the durative marker *zhe*.

Key words: temporal relations, experiential *guo*, semantics-pragmatics interface

1. INTRODUCTION

The clauses in a discourse can be organized temporally. In languages, such as English, which are marked for tense, tense plays a role in determining the temporal relation between two sentences. For sentences marked with the same tense, for example, past tense, Asher and Lascarides (2003) propose that rhetorical relations determine temporal relations, among other things.

Though there is still discussion as to whether Mandarin has tenses (e.g., Lin 2003b vs. Lin 2006), at least it is a fact that Mandarin is not morphologically marked for tenses. Thus, explicit tense information such as the verbal inflections in English cannot help to determine temporal relations in Mandarin. However, Mandarin has a rich aspectual system (e.g., Li and Thompson 1981: 184-237). Chang (1998), Smith and Erbaugh (2001, 2005), Lin (2003a, 2006), etc., respectively, propose that situation types (lexical aspect or aktionsart) determine temporal reference in Mandarin. Along similar lines, it is reasonable to hypothesize that, in Mandarin, aspect markers can influence temporal relations. This paper examines how the experiential *guo*, a perfective marker, affects temporal relations. It is argued that the experiential *guo*, by default, specifies that a clause containing the experiential *guo* serves as informational background, which indicates temporal precedence, and that the internal process of an eventuality presented by the experiential *guo* cannot be accessed unless accessing the process is required. That is, following Asher and Lascarides' (2003) proposal about the interaction between rhetorical relations and temporal relations, this paper argues that aspect markers in Mandarin affect temporal relations via rhetorical relations either by specifying a default rhetorical relation or by setting a constraint on rhetorical relations, consistent with Wu's (2004, 2005b, 2007a, 2007b) research on aspect markers including the perfective *le*, the progressive *zai*, and the durative *zhe*, and on sentences with no aspect markers.

This paper is organized as follows. In Section 2, I briefly review the studies on the semantics of the experiential *guo*, such as Yeh (1993, 1996) and Wu (2005a, 2008). Based on the semantics of *guo*, I propose a hypothesis for the role of *guo* in temporal relations. In Section 3, I test the hypothesis against examples retrieved from the five-million-word Academia Sinica Balanced Corpus (for short, the Sinica Corpus). In Section 4, I model the phenomena observed with Segmented Discourse

Representation Theory (henceforth, SDRT). In Section 5, I conclude this paper.

2. SEMANTICS OF THE EXPERIENTIAL *GUO*

The experiential *guo* is a perfective marker. It is called 'experiential' because it indicates that the subject has had the experience of having done something or has experienced something at least once. But, as noted in Yeh (1993: 15), an experience expressed by the experiential *guo* is very different from the thematic role *experiencer*. An NP receiving an experiencer role must be sentient, but this is not a requirement of the experiential *guo*. In (1), the subject is not sentient, but it is still compatible with the experiential *guo*.

(1) zhe   ge guojia fasheng <u>guo</u>   neizhan
     this CL country happen   Exp[1]   civil war
     'This country had a civil war before.'

The literature on the experiential *guo*, such as Chao (1968), Iljic (1990), Smith (1997), Yeh (1993, 1996), etc., proposes four important properties of *guo*. First, *guo* has a 'class' meaning. Secondly, *guo* involves discontinuity. Thirdly, *guo* goes only with recurrable eventualities, and fourthly an eventuality presented by *guo* is temporally independent of others in the same discourse.

Observing that *guo* behaves parallel to a universal quantifier in 'temporal subordination' (Kartunnen 1976) in that a sentence independent of another one which is quantified over by a universal quantifier can access the discourse referents in the DRS of the sentence with the universal quantifier as long as the independent one contains a temporal quantifier, as in (2) and (3). Yeh proposes that *guo* is a quantifier, just like *every*, though *guo* quantifies over eventualities, while *every* quantifies over entities.

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[1] The abbreviations used in this paper include: CL for classifiers, DE for the modifier-modifiee marker, DRS for Discourse Representation Structure, Exp for the experiential marker *guo*, Pfv for the perfective marker *le*, Prc for particles, TMP_LOC for temporal location phrases and REL for the relative clause marker.

(2) a. Harvey courts a girl at <u>every</u> convention.
    b. She *(always) comes to the banquet with him.

(3) a. ta qu nar   diao <u>guo</u> yu
      he go there hook Exp fish
      'He went there to fish (before).'
    b. *(zongshi) diao dao banye   cai hui jia
       always   hook to   midnight then return home
       'He *(always) fished until midnight and then went home.'

Yeh tries to explain the four properties of *guo* with the unified semantics she proposes. A quantifier needs to obey the Plurality Condition of Quantification (de Swart 1991) and this is why *guo* has a 'class' meaning. The 'class' is the plural set of entities quantified over. To be compatible with *guo*, an eventuality occurs more than once so that a set of multiple occurrences of the eventuality can be formed, i.e., the Recurrence condition. For the same eventuality to occur more than once, it has to be discontinued first. Because *guo* is a quantifier and creates a sub-DRS, the eventuality presented by *guo* is not accessible to eventualities outside the sub-DRS created by *guo*. This is where temporal independence comes from.

Wu (2005a, 2008) observes examples counter to the critical evidence for Yeh's (1993, 1996) quantificational approach. Yeh's account of *guo* is based on the observation that an eventuality presented by *guo* is inaccessible to another eventuality unless the latter is presented by a temporal quantifier, such as *zongshi* 'always'. However, Wu find examples from the Sinica Corpus where an eventuality presented by *guo* can be accessed by another eventuality that is not quantified over by any temporal quantifier, as in (4) and (5) below.

(4) a. liang nian qian ta hui   <u>guo</u> hunan laojia
      two   year before he return Exp Hunan hometown
      'Two years before, he returned to his hometown in Hunan.'
    b. yijiuwuba nian di   zaidu fan   xiang shi
      1958   year end again return home time
      'When he returned home again at the end of 1958, …'

c. faxian renshiyifei[2]
   find   everything change
   '(he) found that everything had changed.'

(5) a. wo zhi ting <u>guo</u> qian xiaozhang gei huaxue
     I   only hear Exp Qian president for chemistry
     xi   tongxuemen zuo   de   youguan
     department classmates   make REL about
     fenxi   huaxue   de   yanshuo
     analytic chemistry DE   speech
     'I only heard the speech on analytic chemistry that
      President Qian delivered to the chemistry majors once.'
   b. ta yuzhongxinchangde mianli   tongxue yi fan hua
     he sincerely   encourage classmate one CL words
     'He sincerely encouraged the students he addressed.'
   c. zhi jin hai jiyiyouxin
     to   now still memory-fresh
     'The memory of it is still fresh till now.'

In (4), (4b) advances the narrative time of (4a), but (4b) does not contain any temporal quantifier. In (5), (5b) is temporally included in (5a), and again (5b) does not contain a temporal quantifier. The two examples show that accessing an eventuality presented by *guo* does not require a temporal quantifier, and therefore *guo* does not behave parallel to universal quantifiers, such as *every*. That is, we can conclude that the experiential *guo* cannot be a quantifier.

Arguing against Yeh's quantificational account, Wu (2008) proposes that the experiential *guo* in Mandarin predicates on situations whose semantics as a whole is terminable. Situations in the world can be categorized into one of two groups in terms of the number of the components in the semantics: The first group denotes bipartite semantics, i.e., a bounded event plus a (resultative) state or an activity plus a

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[2] A reviewer asks if it is possible that there is an implicit/covert modal in (4c) and (5b) interpreted like 'just as usual' so that the quantifier-account of the experiential *guo* can still work. In the Sinica Corpus, the paragraph containing (4) is about the situations in Hunan before and after the Cultural Revolution in China. The passage presented as (4) in this paper actually provides a contrast between the situation of Hunan before the Cultural Revolution and that after the Cultural Revolution. Therefore, it is not likely that there is an implicit modal meaning 'just as usual' here.

(resultative) state, and the second group unary semantics, which can be either an activity or a state. Terminability means completion in the case of a bounded situation and termination in that of an unbound situation. To be compatible with experiential *guo*, both parts in bipartite semantics and the only part in unary semantics must be terminable.

Because terminability is the required condition for compatibility with experiential guo, Wu argues that, among the properties that *guo* is usually claimed to have in the literature, only discontinuity is an inherent property of *guo*. As for properties such as a class meaning and the condition of recurrence, Wu first shows that an eventuality guo presents does not necessarily have a class meaning. Then he argues that these two properties are just one facet of terminability and that they both follow naturally from terminability. Furthermore, he establishes that temporal independence and indefinite past are defeasible inferences from terminability. He also argues that the difference between the perfective *le* and the experiential *guo* lies in that the perfective *le* accesses only the left side of the semantics of a situation *le* presents, while the experiential *guo* accesses the whole semantics of a situation *guo* presents. This difference explains why the perfective *le* and the experiential *guo* are interchangeable in some contexts, but not in the others. Moreover, a terminated situation tends to occur in the remote unknown past.

Based on the proposal that the experiential *guo* presents a situation whose semantics as a whole is terminable and that a situation presented by *guo* was realized in the unknown past, the experiential *guo* is hypothesized to have two effects on temporal relations:

(6) Hypothesis for the role of the experiential *guo* in temporal relations:
    a. The event time of a situation presented by *guo* cannot be advanced unless the time is explicitly specified.
    b. The internal process of a situation presented by *guo* cannot be accessed unless it is forced open so as to render it accessible.

3. TESTING THE HYPOTHESIS

The experiential *guo* presents an eventuality that occurs in the unknown past, i.e., the event time is unknown. Since the event time is unknown, it cannot be advanced. However, if the event time of an eventuality that *guo* presents is specified, then the event time can be

advanced. In SDRT terms, when the event time of an event is advanced, the sentence described by the event is connected to the sentence following it by *Narration*. Hypothesis (a) is borne out by the example below.

(7) a. *(liang nian qian)   ta hui   <u>guo</u> hunan laojia
       two year before he return Exp Hunan hometown
     'Two years before (1958), he returned to his hometown in
      Hunan.'[3]
  b. yijiuwuba nian di   zaidu fan   xiang shi
    1958   year end again return home time
    'When he returned home again at the end of 1958, …'[4]

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[3] Given this example, one might try to associate *guo* with the past perfect in English. However, *guo* does not equal the past perfect. For example,

(i) a. ta *(zuotian)   chi guo niupai
      he   yesterday eat Exp steak
      'He ate steak yesterday.'
  b. jintian you   yao   chi
     today   again will   eat
     '(he) will eat (steak) again today.'
  c. shizai tai you   qian   le
     really too have money Prc
     '(all of which is to say that he is) really too rich.'

Guo in (ia) is not past perfect because it does not describe an event that occurred before a past time. The important thing here is that a temporal adverbial is obligatory in this example and in (7).

[4] A reviewer suggests that the experiential *guo* may not need explicit time to occur in a *Narration* context. S/he uses the following examples to support this possibility.

(i) a. ta hui   guo hunan laojia   <u>hen duo   ci</u>
      he return Exp Hunan hometown very many time
      'He returned to his hometown in Hunan many times.'
  b. yijiuwuba nian di   zaidu fan   xiang shi
     1958   year   end again return home time
     'When he returned home at the end of 1958,'
  c. fanxian renshiyifei
     find   everything change
     '(h)e found that everything had changed.'

c. faxian renshiyifei
   find   everything change
   '(he) found that everything had changed.'

In the example above, (7b) occurs after (7a). In Smith's (2003) terms, (7b) advances the narrative time of (7a). In order to advance the narrative time, the event time of (7a) must be specified. This is why the temporal phrase *liang nian qian* 'two years before' is obligatory in (7a).

An eventuality that *guo* presents can temporally include another eventuality. Temporal inclusion for the experiential *guo* is possible only when another eventuality is a specific example of or provides more details on the eventuality that *guo* presents. See the example below.

(8) a. wo zhi ting guo qian xiaozhang gei huaxue
       I   only hear Exp Qian president for chemistry
       xi   tongxuemen zuo   de   youguan
       department classmates   make REL about
       fenxi   huaxue   de   yanshuo
       analytic chemistry DE   speech
       'I only heard the speech on analytic chemistry that
         President Qian delivered to the chemistry majors once.'

(ii) a. ta chi guo niupai hen   duo   ci
        he eat Exp steak   very many time
        'He has eaten steak many times.'
     b. jintian you   yao chi
        today   again is   going to eat
        'Today, he is going to eat (steak) again.'
     c. shizai tai you qian   le
        truly too have money Prc
        'He is truly rich.'

It is true that in these two examples the events described by the (b) sentences temporally follow the events described by the (a) sentences. However, this temporal relation does not mean that the (a) and (b) sentences are connected by *Narration*. A good test is to use cue phrases such as *zhihou* 'after'. This cue phrase can be added between two sentences connected by *Narration*. Hence, it can be added to (7b) and the discourse remains coherent. However, this cue phrase cannot be added to (ib) and (iib). This suggests that (ia) and (ib) on the one hand, and (iia) and (iib) on the other are not examples of *Narration*. Therefore, these two examples are not counterexamples to Hypothesis (6).

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  b. ta yuzhongxinchangde mianli   tongxue yi fan hua
   he sincerely   encourage classmate one CL words
   'He sincerely encouraged the students he addressed.'
  c. zhi jin hai jiyiyouxin
   to now still memory-fresh
   'The memory of it is still fresh till now.'

  His encouragement to the students he addressed, described in (8b), obviously is one of the topics talked about in the speech described by (8a). That is, (8b) provides more details about (8a). Only under this circumstance can the internal process of an eventuality that *guo* presents be accessed. This point is similar to that in regard to the perfective *le* (Wu 2005b) because the experiential *guo* and the perfective *le* are perfective markers, which present an event as a whole (e.g., Smith 1997: 66-69, Wu 2005c, etc).

  The temporal relations in the two examples above are determined by cue phrases. In (7b), *zaidu* 'again' indicates that an event is repeated at a later time. This cue phrase tells us that (7b) occurs after (7a). In (8), encouragement can be part of a speech. This 'part of' relationship advises that (8b) provides more details about (8a), which specifies temporal inclusion.[5]

  A crucial question arises at this point, i.e., whether the experiential *guo* directly determines temporal relations. The two examples above tell us that the answer is no. The experiential *guo* does not directly determine temporal relations. If it did, it would be difficult to explain why temporal progression is evoked in (8) whereas temporal inclusion is induced in (9).

  Then, what determines temporal relations in the examples above? Following Asher and Lascarides (2003), I propose that rhetorical relations also determine temporal relations in Mandarin and that cue phrases or information, among other things, specify rhetorical relations, which in turn decide temporal relations. This proposal is supported by (7) and (8). (7c) is attached to (7b) to form a chunk of discourse, which in

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[5] An anonymous reviewer asks if it is impossible for the sequences to manifest a temporal continuation in addition to temporal inclusion According to my research on temporal relations in Mandarin, an elaborating situation can temporally precede a situation elaborated on only when the situation elaborated on is an achievement (Wu 2007a). For other cases, *Elaboration* indicates temporal inclusion, as discussed in this paper and others such as Wu (2005b, 2007b).

turn is attached to (7a) by *Narration*. As previously discussed, the cue for this rhetorical relation is *zaidu* 'again'. *Narration* specifies temporal progression. This inference matches a native speaker's intuition about the temporal relation in (7).

The 'part of' relationship discussed previously for (8) is referred to as a 'subtype' relationship (Asher and Lascarides 2003: 204-207). This cue information specifies that (8b) is attached to (8a) by *Elaboration*. *Elaboration* indicates temporal inclusion, which also fits a native speaker's intuition about the temporal relation in (8).

The function of the experiential *guo* in the two examples above is to set constraints on rhetorical relations. An eventuality presented by *guo* needs its event time to be explicitly specified so that the event time can be advanced. Hence, when a clause with *guo* is connected to the following clause by *Narration*, the clause with *guo* must contain a temporal phrase that specifies the event time. On the other hand, the internal process of an eventuality presented by *guo* cannot be accessed because *guo* is a perfective marker and a perfective marker presents an eventuality as a whole. However, *Elaboration* requires accessing the internal process of the elaborated eventuality. Therefore, only *Elaboration* can access the internal process of an eventuality presented by *guo* which is elaborated on.

What may occur in the case of a discourse with no cue phrase or cue information that can indicate any rhetorical relation? Let us look at (9).

(9) a. women zuo <u>guo</u> zhe jian shi   yi   ci
     we   do   Exp this CL   thing one time
     'We did this once.'
   b. zhe ci   huoxu ye   mei wenti
     this time maybe also no   problem
     'Maybe, this time, we won't have a problem either.' [6]

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[6] An anonymous reviewer suggests that *huoxu* 'maybe' in (9b) may be a cue phrase for informational background and that this possibility undermines the argument for the default function of the experiential *guo*. However, if *huoxu* 'maybe' is removed from (9b), the discourse remains coherent and (9a) still functions as informational background for (9b). The only difference is that without *huoxu* 'maybe' the speaker states, with certainty, that he or she will not have a problem this time. That is, what determines *Background*_I here is the experiential *guo*, not *huoxu* 'maybe'.

There is neither a cue phrase nor cue information in (9) to specify what rhetorical relation connects (9b) to (9a). An experience can serve as a piece of information, based on which an inference can be made. That is, an eventuality presented by *guo* serves as an informational background, represented by the rhetorical relation *Background*$_I$[7], when the context does not specify otherwise. This is the default function of the experiential *guo*.

One valid question to ask about the default function of *guo* is whether the possibility of serving as informational background is a default function of the experiential *guo* only. Can the perfective *le* replace *guo* in (9) and the discourse remain coherent? The answer is no. If *guo* in (9) is replaced with *le*, then the discourse becomes incoherent, as shown in (10).

(10) a. women zuo <u>le</u> zhe jian shi   yi   ci
　　　　we 　do Exp this CL   thing one time
　　　　'We did this once.'
　　 b. !zhe ci   huoxu ye   mei wenti[8]
　　　　 this time maybe also no   problem
　　　　'Maybe, this time, we won't have a problem either.'

This contrast between the (9) and (10) follows from the difference in the semantics of these two perfective markers. The experiential *guo* describes an experience. Drawing inferences from one's experience is a natural process for humans. On the other hand, the perfective *le* specifies the completion or termination of an event. What naturally follows a completed or terminated event is another event, not an inference.[9] This is

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[7] Asher and Lascarides (2003) do not distinguish different kinds of *Background*. The *Background* they propose is actually a temporal background, represented as *Background*$_T$ in this paper and Wu (2004, 2005b, 2007a). However, as evidenced in this paper, another kind of *Background*, i.e., *Background*$_I$, is required because these two kinds of *Background* specify different temporal relations.

[8] A clause/sentence marked with ! means that this clause (or sentence) is a bad continuation to the one before. That is, a discourse consisting of a clause/sentences marked with ! and other clauses/sentences is incoherent.

[9] An anonymous reviewer observes that (10) becomes coherent if *yijing* 'already' is added before *zuo* 'to do' in (10a) and suggests that it is not necessary that what naturally follows a completed or terminated event is another event, not an inference. I suspect that, in addition to temporal anteriority, *yijing* 'already' may also express current relevance,

why Wu (2005b) proposes that the perfective *le* by default indicates *Narration*. Can a completed or terminated event become an informational background? Yes, but only when some kind of pattern is formed. See (11) below.

(11) a. wo liang yiqi   jingli   <u>guo/le</u> wushu   weinan
       I   both together experience Exp/Pfv countless danger
       'We experienced countless dangers together before.'
   b. zhe ci   huoxu ye   neng taotuo
      this time maybe also can   escape
      'Maybe, this time, (we) can also escape.'

In (11a), the sentence that serves as informational background can contain either the experiential *guo* or the perfective *le*. The difference between (10a) and (11a) lies in that (10a) describes a specific event whereas (11a) denotes non-specific plural events. Because (11a) describes a series of non-specific events, the sentences denote a pattern and humans can also draw inferences from a pattern. This is why (11) remains coherent even though the experiential *guo* is replaced with the perfective *le* in (11a), while (10) becomes incoherent once the experiential *guo* is replaced with the perfective *le*.

Other rhetorical relations can connect a clause to another with *guo* as long as they do not specify a temporal relation that violates Hypothesis (6). For example, an event that *guo* presents can serve as a reason. See (12).

(12) a. ni   bu yong danxin xiaoxiao hui milu
      you no need worry Xiaoxiao will lose one's way
      'You need not worry if Xiaoxiao will lose her way.'

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similar to the use of the present perfect in English. In addition to temporal precedence, the English perfect also indicates current relevance. It has been observed that in certain dialects of American English, the adverb *already* can be used alone in the sentence to indicate current relevance. If *yijing* 'already' in Mandarin Chinese can also indicate current relevance, then it is natural to draw an inference from a sentence presented by *yijing* 'already' because drawing an inference is one of the ways to show current relevance. This proposal for the semantics of *yijing* 'already' has one advantage. When *yijing* 'already' and the perfective occur together, *yijing* 'already' will not be a semantic dummy with no semantic function at all, and instead it expresses current relevance.

    b. yinwei   ta   lai   <u>guo</u>   women jia   haoji   ci
       because she come Exp we   home several time
       'Because she has been to our home several times.'

    The cue phrase *yinwei* 'because' in (12b) clearly specifies that (12b) explains (12a). Asher and Lascarides (2003: 160) suggest that, when the reason is an event, the reason occurs before the result. The difference between the temporal relation indicated by *Narration* and the one indicated by *Explanation* is that, without a temporal adverbial specifying otherwise, *Narration* says that the second event immediately follows the first one, while *Explanation* just says that the event serving as the reason occurs before the one as the result, but does not say how far apart these two events should be. This difference is why a sentence with *guo* needs a temporal adverbial to specify its event time when the following sentence is connected to it by *Narration*. The second event needs to know the event time of the first one so that it can follow the first one. A sentence with *guo* that serves as a reason does not need a temporal adverbial to specify its event time because an event presented by *guo* occurs in some indefinite past and this 'indefinite past' is able to guarantee temporal precedence.

    To sum up, the experiential *guo* affects temporal relations via rhetorical relations. It specifies a default rhetorical relation, *Background*₁, which indicates temporal precedence. It sets two constraints on rhetorical relations. Firstly, the experiential *guo* presents an eventuality that occurs in some indefinite past and therefore its event time is unknown, unless the time is specified explicitly. Since *Narration* requires the event times of all of the events that occur in sequence, the event time of an eventuality that *guo* presents needs to be specified to be connected by *Narration*. Secondly, the experiential *guo* is a perfective marker, which presents an eventuality as a whole. Therefore, the internal process of an eventuality that *guo* presents cannot be accessed unless accessing the process is required. Since *Elaboration* is the only rhetorical relation that requires accessing the internal process, the internal process of an eventuality that *guo* presents can be accessed only when the eventuality is elaborated on.

4. AN SDRT ACCOUNT

The discussion in Section 3 reveals two points about the relationship between aspect markers and temporal relations in Mandarin. First, aspect markers do not directly determine temporal relations because a sentence with the experiential *guo* can have different kinds of temporal relations with the other sentences in the discourse. Secondly, aspect markers indirectly affect temporal relations via rhetorical relations. The semantics of the experiential *guo* determines the influence on rhetorical relations. To begin with, since *guo* denotes an experience and drawing inferences from an experience is a natural process for humans, the default function of *guo* is to indicate *Background*$_I$, informational background. That is, a sentence with *guo* serves as informational background unless the context specifies otherwise. Furthermore, since *guo* presents an event that occurs in some indefinite past, the event time of such an event needs to be specified so that it can be connected by *Narration*. Finally, because *guo* is also a perfective marker, the internal process of an event presented by *guo* cannot be accessed unless the event is elaborated on.

To capture the default function and the two constraints of the experiential *guo*, I propose an axiom and formalize the two constraints as in (13). I also propose the meaning postulate to infer a temporal relation from *Background*$_I$ below.

(13) a. Axiom for the Experiential *guo*

$(?(\alpha, \beta, \lambda) \wedge guo(....)(\alpha)) > \text{Background}_I(\beta, \alpha, \lambda)$

b. Constraint on *Narration*:

$(\text{Narration}(\alpha, \beta, \lambda) \wedge guo(...)(\alpha)) \rightarrow \text{TMP\_LOC}(...)(\alpha)$

c. Constraint on *Elaboration*:

$(\text{part\_of}(e_\beta, e_\alpha) \wedge guo(...)(\alpha) \wedge ?(\alpha, \beta, \lambda)) \rightarrow Elaboration(\alpha, \beta, \lambda)$

d. Meaning postulate for inferring temporal relations

$\Phi_{\text{Background}_I(\beta, \alpha)} \Rightarrow e_\alpha \prec e_\beta$

Let us look at the formulae above. (13a) says that if β is attached to α to form a discourse λ by an underspecified rhetorical relation and α contains the experiential *guo*, then by default α is the informational background of β. This is a default inference because it can be over-ridden when there is explicit information in the context specifying otherwise.

(13b) says that if β is connected to α to form a discourse λ by *Narration*, and α contains the experiential *guo*, then α must contain a temporal adverbial. This is a monotonic inference because it has to be obeyed.

(13c) says that if the event described by β is temporally included in the event described by α, and α contains the experiential *guo*, then it must be *Elaboration* that connects β to α. This is also a monotonic inference because it cannot be violated.

(13d) says that, if α is the informational background for β, then the event time of α must precede that of β.

Let us demonstrate how the axiom, the two constraints, and the meaning postulate in (13) work under SDRT to derive correct temporal relations and to block incoherent discourse. The first example is the default function of *guo*.

(14) a. women zuo <u>guo</u> zhe jian shi   yi   ci
     we   do Exp this CL   thing one time
     'We did this once.'
  b. zhe ci   huoxu ye   mei wenti
     this time maybe also no   problem
     'Maybe, this time, we won't have a problem either.'

In SDRT, the sentences in a discourse are translated into glue logic formulae first. The two sentences in (14) are translated into glue logic formulae as in (15).
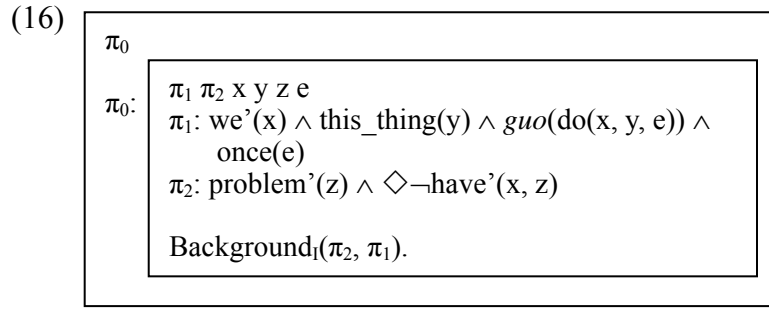
(15)   a. π_1: we'(x) $\wedge$ this_thing(y) $\wedge$ *guo*(do(x, y, e)) $\wedge$ once(e)[10]
     b. π_2: problem'(z) $\wedge$ $\Diamond\neg$have'(x, z)

When π_2 comes into this discourse, it needs an attachment site. There are two available here: one is π_1 and the other is at the top of the discourse. If π_2 is attached to the top of the discourse, then its relation with π_1 is not captured. This failure violates Maximal Discourse Coherence (MDC) (Asher and Lascarides 2003: 230-237). Therefore, it has to be attached to π_1. What rhetorical relation attaches π_2 to π_1? There

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[10] The first person plural pronoun and a definite NP are represented this way to simplify the formalism here. The logic formulae of the temporal adverbials in (18), the second person pronoun and the perfect in (22) are also simplified for the same reason. These are just simplifications and it is not suggested that they should be dealt with this way.

is no cue phrase or any information in (14) to specify an attachment. Hence, (13a) comes into play and allows π_2 to be attached to π_1 by *Background*$_I$. The SDRS for (14) is given below.

(16)

$$\boxed{\begin{array}{l} \pi_0 \\[4pt] \pi_0: \boxed{\begin{array}{l} \pi_1\ \pi_2\ \text{x y z e} \\ \pi_1\text{: we'(x)} \wedge \text{this\_thing(y)} \wedge \textit{guo}(\text{do(x, y, e))} \wedge \\ \qquad \text{once(e)} \\ \pi_2\text{: problem'(z)} \wedge \Diamond\neg\text{have'(x, z)} \\[6pt] \text{Background}_I(\pi_2, \pi_1). \end{array}} \end{array}}$$

Then the rhetorical relation is interpreted in the Satisfaction Schema, as in (17).

(17) Satisfaction Schema for *Background*$_I$
 (w, f) $[\![$*Background*$_I(\pi_2, \pi_1)]\!]_M$ (w', g) iff
 (w, f) $[\![K_{\pi_1} \wedge K_{\pi_2} \wedge \Phi_{\text{Background}_I(\pi_2, \pi_1)}]\!]_M$ (w', g)

(17) needs some explanation. K_{π_1} and K_{π_2} refer to the semantic contents of π_1 and π_2, respectively. $\Phi_{\text{Background}_I(\pi_2, \pi_1)}$ refers to the meaning postulate for *Background*$_I$ that connects π_2 to π_1. The Satisfaction Schema (17) means that *Background*$_I(\pi_2, \pi_1)$ is true if and only if K_{π_1}, K_{π_2}, and the meaning postulate $\Phi_{\text{Background}_I(\pi_2, \pi_1)}$ are all true.
 The meaning postulate (13d) tells us that when the informational background of π_2 is π_1, then the event time of π_1 precedes that of π_2. This inference matches a native speaker's intuition about the temporal relation of this example.
 Next, let us look at an example of *Narration*.

(18) a. *(liang nian qian) zhangsan hui   <u>guo</u> hunan laojia
   two year before Zhangsan return Exp Hunan hometown
  'Two years before, Zhangsan returned to his hometown
   in Hunan.'

b. yijiuwuba nian di zaidu fan xiang shi
1958 year end again return home time
'When he returned home again at the end of 1958, …'
c. faxian renshiyifei
find everything change
'(he) found that everything had changed.'

Again, the sentences in (18) are translated into glue logic formulae.

(19) π_1: Zhangsan'(x) $\wedge$ hometown'(y) $\wedge$ return'(x, y, e) $\wedge$
two_year_before'(e) $\wedge$ guo'(e)
π_2: home'(v) $\wedge$ return'(u, v, e') $\wedge$ end_of_1958'(e') $\wedge$ u = ?
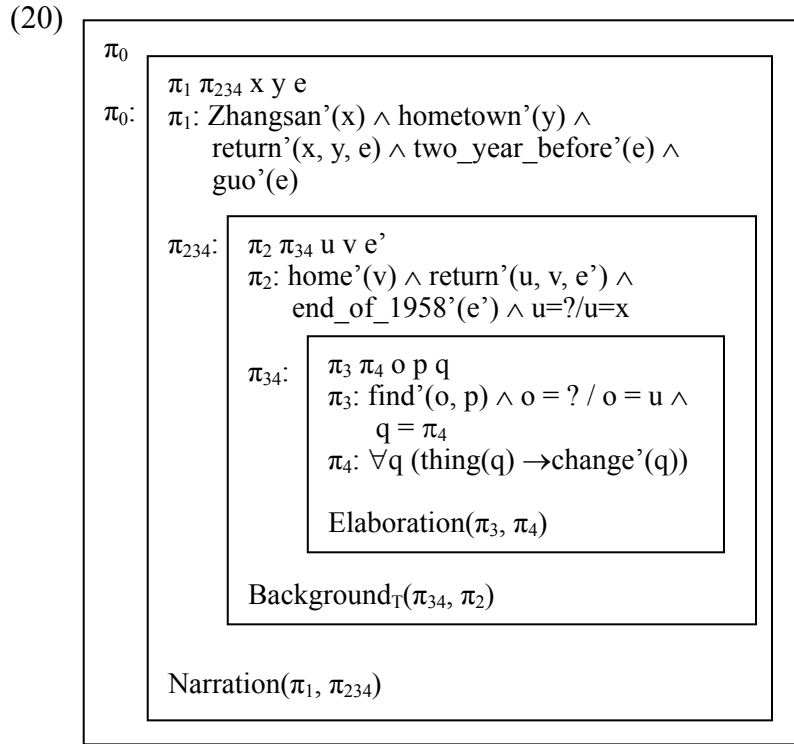π_3: find'(o) $\wedge$ o = ?
π_4: $\forall$p change'(p)

When π_2 comes into the discourse, it also has two available attachment sites, π_1 and the top of the discourse. If it is attached to the top of the discourse, then its underspecified anaphor will not be able to find an antecedent because the top of the discourse does not have any candidate. Hence, π_2 has to be attached to π_1. The cue phrase *zaidu* 'again' indicates that these two sentences are connected by *Narration*. Since π_2 is attached to π_1, the two arguments in π_1, i.e., *x*, *y*, are candidates for the antecedent to the underspecified anaphor in π_2. Since *hometown* cannot be the subject of *return*, *u* is resolved to *x*, which refers to Zhangsan.

When π_3 comes into the discourse, it has three possible attachment sites: π_1, π_2, or the top of the discourse. If it is attached to the top of the discourse, then its underspecified anaphor cannot find an antecedent. If it is attached to π_1, then its relation with π_2 is not captured. Both ways of attachment violate MDC. Hence, π_3 has to be attached to π_1. The cue phrase ....*shi* 'when' in π_2 indicates that π_3 is attached to π_2 by *Background*$_T$, a temporal background.

One point worth attention here is that π_3 is attached to π_2 by *Background*$_T$. Since π_3 is attached to π_2 to form a short discourse, π_2 cannot be attached to π_1 alone. Instead, π_3 is attached to π_2 to form a small chunk π_{23}, which in turn is attached to π_1. Since π_3 is attached to π_2, the underspecified anaphor in π_3 is resolved to *u*, which in turn is resolved to *x*, which finally refers to Zhangsan.

Asher and Lascarides (2003: 283-287) suggest that a clausal complement elaborates on the verb taking the complement. Hence, π_4 is attached to π_3 by *Elaboration*. Since π_4 has to be attached to π_3 first, π_3 cannot be attached to π_2 alone. Rather, π_4 and π_3 form a short discourse π_{34}, which in turn is attached to π_2 to form π_{234}. Then, π_{234} is attached to π_1.

The SDRS for (18) is given below. *Narration*(π_1, π_{234}) in the SDRS is interpreted in the Satisfaction Schema as in (21).

(20)

π_0

π_0:
> π_1 π_{234} x y e
> π_1: Zhangsan'(x) $\land$ hometown'(y) $\land$
> return'(x, y, e) $\land$ two_year_before'(e) $\land$
> guo'(e)
>
> π_{234}:
> > π_2 π_{34} u v e'
> > π_2: home'(v) $\land$ return'(u, v, e') $\land$
> > end_of_1958'(e') $\land$ u=?/u=x
> >
> > π_{34}:
> > > π_3 π_4 o p q
> > > π_3: find'(o, p) $\land$ o = ? / o = u $\land$
> > > q = π_4
> > > π_4: $\forall$q (thing(q) $\rightarrow$ change'(q))
> > >
> > > Elaboration(π_3, π_4)
> >
> > Background$_T(\pi_{34}, \pi_2)$
>
> Narration(π_1, π_{234})

(21) Satisfaction Schema for *Narration*
> (w, f) $[\![$*Narration*$(\pi_1, \pi_{234})]\!]_M$ (w', g) iff
> > (w, f) $[\![K_{\pi_1} \land K_{\pi_2} \land \Phi_{\text{Narration}_I(\pi_1, \pi_{234})}]\!]_M$ (w', g)

According to Constraint (13b), in the case of a sentence with *guo* that is connected to the following sentence by *Narration*, the sentence with

guo must contain a temporal adverbial. π_1 does contain a temporal adverbial, *liang nian qian* 'two years before'. If the temporal adverbial is absent, i.e., π_1 does not include *liang nian qian* 'two years before', then the discourse will be ruled out as incoherent because of the violation of Constraint (13b).

Finally, let us look at an example where a clause with *guo* is connected by a rhetorical relation that specifies a temporal relation obeying Hypothesis (6).

(22) a. ni   bu yong danxin xiaoxiao   hui   milu
        you no need   wory   Xiaoxiao   will lose one's way
        'You need not worry if Xiaoxiao will lose her way.'
     b. yinwei   ta   lai   <u>guo</u> women jia   haoji   ci
        because she   come   Exp   we   home   several time
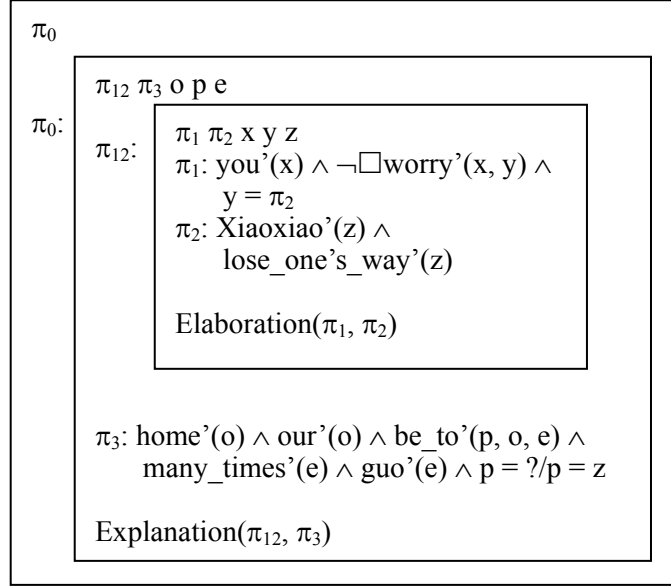   'Because she has been to our home several times.'

The two clauses in (21) are translated into glue logic formulae as in (23).

(23) π_1: you'(x) $\land$ $\neg\Box$worry'(x, y) $\land$ y = π_2
     π_2: Xiaoxiao'(z) $\land$ lose_one's_way'(z)
     π_3: home'(o) $\land$ our'(o) $\land$ be_to'(p, o, e) $\land$ many_times'(e) $\land$
          guo'(e) $\land$ p = ?

(22a) contains a verb that takes a clausal complement, which is represented as π_2. Again, π_2 is attached to π_1 by *Elaboration*, as discussed above. When π_3 comes into the discourse, it has four available attachment sites: π_1, π_2, π_{12}, and the top of the discourse. It cannot be attached to the top of the discourse because the underspecified anaphor *p* cannot find an antecedent. It cannot be attached to π_1 because the first person plural possessive in π_3 includes both the speaker and the listener and it is not reasonable to claim that the listener has been to his or her own home several times. π_3 cannot be attached to π_2 either because the relationship between π_1 and π_3 will be missed. Hence, π_3 is attached to π_{12} by *Explanation*, as indicated by the cue phrase *yinwei* 'because'. *p* is resolved to *z*, which refers to *Xiaoxiao*.

The SDRS for (22) is given below.

(24)

$$\pi_0$$

π_0:	$\pi_{12}\ \pi_3\ o\ p\ e$
	π_{12}: $\begin{array}{l} \pi_1\ \pi_2\ x\ y\ z \\ \pi_1\text{: you'}(x) \wedge \neg\square\text{worry'}(x, y) \wedge \\ \qquad y = \pi_2 \\ \pi_2\text{: Xiaoxiao'}(z) \wedge \\ \qquad \text{lose\_one's\_way'}(z) \\ \\ \text{Elaboration}(\pi_1, \pi_2) \end{array}$
	π_3: home'(o) $\wedge$ our'(o) $\wedge$ be_to'(p, o, e) $\wedge$ many_times'(e) $\wedge$ guo'(e) $\wedge$ p = ?/p = z
	Explanation(π_{12}, π_3)

Explanation(π_{12}, π_3) is interpreted in the Satisfaction Schema.

(25) Satisfaction Schema for *Explanation*

(w, f) $\llbracket$*Explanation*$(\pi_{12}, \pi_3)\rrbracket_M$ (w', g) iff

(w, f) $\llbracket K_{\pi_1} \wedge K_{\pi_2} \wedge \Phi_{\text{Explanation}(\pi_{12}, \pi_3)}\rrbracket_M$ (w', g)

Asher and Lascarides (2003: 160) suggest that, when an event β explains α, β temporally precedes α. This temporal relation does not violate any part of Hypothesis (6). That is, the constraints in (6) are obeyed and the default function of *guo* is irrelevant in this example. Hence, this discourse receives this temporal relation, which fits a native speaker's intuition.

5. CONCLUSION

This paper argues that aspect markers in Mandarin do not directly determine temporal relations. Instead, aspect markers indirectly affect temporal relations via rhetorical relations. The experiential *guo*

influences temporal relations in three ways. First, because *guo* denotes an experience and it is a natural process for humans to draw inferences from an experience, a sentence containing *guo* serves as informational background, when the context does not specify otherwise. Secondly, because *guo* presents an eventuality that occurs in the indefinite past, the event time is unknown. In order to be connected to the following sentence by *Narration*, a sentence with *guo* needs a temporal adverbial to explicitly specify its event time. Thirdly, because *guo* is a perfective marker, which presents an eventuality as a whole, the internal process of an eventuality presented by *guo* cannot be accessed unless accessing the process is required. Other rhetorical relations can connect a sentence with *guo* as long as they do not specify a temporal relation which violates the three points above.

The first point above is formalized as an axiom to make a default inference for *Background*$_I$ for a sentence with *guo*. The last two points are formalized as two monotonic inference rules to guarantee that they are obeyed. The temporal relation indicated by the new rhetorical relation *Background*$_I$ is formalized as a meaning postulate, which is interpreted in the Satisfaction Schema in SDRT. Given the axiom, the two constraints, and the meaning postulate proposed in this paper, SDRT can accurately derive the temporal relations and block inherent discourse from being giving an interpretation.

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經驗貌「過」對漢語時序關係的影響

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本篇論文探討經驗貌「過」對漢語時序關係的影響。本文論證：經驗貌「過」以下列方式透過修辭關係間接影響時序關係：一、「過」標明一基本之修辭關係 –– 「經驗背景」，而這個修辭關係表示，事件發生的時間，在另一事件之前。二、「過」所引領之事件，如無必要，其內部過程不能被讀取。這兩點均是由經驗貌「過」之時貌語意而來。廣義而言，本篇論文顯示了，漢語中的時貌標記並不直接決定時序關係，而是以下面兩個方式，根據其時貌語意，透過修辭關係間接決定時序關係：一、標明一基本之修辭關係，二、提出應遵守之時序限制。這個結論，與本人(2004、2005b、2007b)的研究結論相呼應。

關鍵詞：時序關係、經驗貌「過」、語意–語用界面