The order of motion morphemes in Chinese multi-morpheme motion construction: An analysis based on scale structure

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Abstract: Motion is one of the most basic human activities, but cross-linguistically, languages do not necessarily adopt the same means to express motion events. In Mandarin Chinese, motion events are frequently expressed through the use of multi-morpheme constructions (e.g., _tuì-huí_ Beijing ‘recede back to Beijing’ formed from two motion morphemes, _tuì_ ‘recede’ and _huí_ ‘return’). In light of recent work on “scale structure”, this paper investigates the ordering of motion morphemes in Chinese multi-morpheme motion constructions. We propose that the order of Chinese motion morphemes is predictable. Specifically, Chinese motion morphemes can be classified into four types based on their scale structure, and these four types form an implicational hierarchy which predicts the order of motion morphemes in a multi-morpheme motion construction. This hierarchy is then verified via two corpus studies. In all, an analysis of motion morphemes based on their associated scale structure provides a new insight into the morphemes’ syntactic distribution in multi-morpheme motion constructions; in addition, the generalization underlying the ordering of Chinese motion morphemes might be extensible to serial-verb motion constructions in other languages, e.g., Thai, and Ewe, as well as Chinese multi-morpheme constructions in other domains, e.g., resultative verbal compounds.

Keywords: Chinese multi-morpheme motion construction morpheme order scale structure

1 Introduction

In Modern Mandarin Chinese (hereafter “Chinese”), motion events (e.g., _walk to school_) are commonly expressed through multi-morpheme motion morphemes (hereafter “MMMC”). For example, _走進教室_ ‘walk enter classroom’ is formed from two motion morphemes _走_ ‘walk’ and _進_ ‘enter’. However, in MMMCs, the order of motion morphemes seems to be unpredictable. For example, in (1), _回_ ‘return’ must follow _退_ ‘recede’; whereas in (2), _回_ ‘return’ must precede _到_ ‘arrive’.

(1) a. 敵人退回關外了。
   b. *敵人回退關外了。

(2) a. 敵人回到關外了。
   b. *敵人到回關外了。

Occasionally, examples are found in which two motion morphemes can appear in either order.

(3) a. 幾個文士就回返了。（PKU Corpus)
   b. 3點鐘啟程返回學校。（PKU Corpus)

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1 For instance, in the first 20 chapters of the novel _The Sun Shines Over the Sanggan River_ (Ding Ling, 1952), 65% of the motion constructions are MMMCs.

2 Previous studies (e.g., Tai 2003, Talmy 2000, Chen & Guo 2009) have not reached a consensus on the lexical status of some motion morphemes, e.g., whether _進_ ‘enter’ is a verb or a directional complement. However, the lexical status of Chinese motion morphemes is not the focus of this study, and the approach adopted in this study can be applied to independent motion verbs, directional complements, and even bound motion morphemes. Therefore, this paper uses the term “motion morpheme” to cover all morphemes expressing motion.

3 PKU Corpus in this paper refers to the corpus of Modern Mandarin Chinese constructed by the Center for Chinese Linguistics at Beijing University. The corpus has 307,317,060 characters updated on 7/20/2009. See http://ccl.pku.edu.cn/.
Therefore, is the order of motion morphemes in MMMCs just a matter of lexicalization that is unpredictable? Or is there any generalization that can predict the order? If yes, what determines the morpheme order? In this paper, we propose that the order of motion morphemes in Chinese MMMCs is predictable. Specifically, Chinese motion morphemes can be classified into four types based on the “scale structure” (Rappaport Hovav & Levin 2010) lexicalized in these morphemes (Lin & Peck, unpublished paper 2010), and these four types form an implicational hierarchy which predicts the order of motion morphemes in a MMC.

2 Previous studies

2.1 Two-way classification of motion morphemes
According to Talmy (1975, 2000), motion morphemes (verbs) can be classified into two types. One is manner-of-motion morpheme which specifies how a motion event is carried out, e.g., 跑 ‘run’, 走 ‘walk’. The other is path morpheme which specifies in which direction a motion event is carried out, e.g., 退 ‘recede’, 回 ‘return’, and 進 ‘enter’.

In a Chinese MMC that consists of a manner-of-motion morphemes and a path morpheme, the manner-of-motion morpheme must precede the path morpheme, as in (4).

(4) a. 她走進教室 b. *她進走教室

However, Talmy’s two-way classification is unable to explain in a MMC that consists of path morphemes only, as in (1-3), why a path morpheme must precede the other path morpheme. There seem to be more subtypes under Talmy’s path morphemes.

2.2 Four-way classification of (motion) morphemes based on their scale structure
Rappaport Hovav & Levin (2010) propose that motion verbs and change of state verbs can be classified into four types according to the verbs’ “scale structure” (Kennedy & McNally 2005, among others). A scale is composed of a set of ordered points or intervals indicating measuring values on a dimension, e.g., height, distance, or temperature (ibid). In the domain of motion, a scale is understood on the dimension of distance, that is, the distance of the moving object with respect to the reference object, and the scale is composed of points which are “a set of contiguous locations which together form a path” and are ordered in the direction of movement (Rappaport Hovav & Levin 2010: 29). For instance, the points in the scale lexicalized in descend are ordered in the direction of gravity (the reference object), whereas the points in the scale of recede are ordered in a direction from the reference object, i.e. the starting point of the receding event. The moving object’s location on the path represents a value for its distance with respect to the reference object; when the moving object change its location along the path, the value changes too, so the change is understood as a scalar change which is measurable (Rappaport Hovav & Levin 2010).

A scale has three properties which classify motion morphemes into four types (ibid): The first property is existence of a scale, i.e. whether the motion takes place along a scale, which classifies motion morphemes into nonscalar change motion morphemes (e.g., fly, run, walk) and scalar change motion morphemes (e.g., recede, return, enter); The second property is boundedness, i.e. whether a scale has an endpoint or not, which further divides scalar change motion morphemes into open scale motion morphemes (e.g., recede, ascend) and closed scale motion morpheme (e.g., return, enter); The third property is
punctuality, i.e. whether motion along a scale is durative (with multiple values) or punctual (with two values, i.e. the starting and ending points). Punctuality divides closed scale motion morphemes into multi-value closed scale motion morphemes (e.g., return, come) and two-value closed scale motion morphemes (e.g., enter, arrive).

Following Rappaport Hovav & Levin (2010), Lin & Peck (unpublished paper 2010) divided Chinese motion morphemes into four types, as presented in Table 1. In addition, Lin & Peck (ibid) have proposed a set of independent tests to determine which type each Chinese motion morpheme falls into.

Table 1 Three properties of a scale determine four types of motion morphemes (ibid.)

<table>
<thead>
<tr>
<th>Types of motion morphemes</th>
<th>Existence of a scale</th>
<th>Boundedness</th>
<th>Punctuality</th>
</tr>
</thead>
<tbody>
<tr>
<td>nonscalar change morpheme (飛 ‘fly’)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>open scale morpheme (退 ‘recede’)</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>multi-value closed scale morpheme (回 ‘return’)</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>two-value closed scale morpheme (進 ‘enter’, 到 ‘arrive’)</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

3 An implicational hierarchy predicting morpheme order

In this paper, I propose that the order of motion morphemes in a Chinese MMMC is predictable. Furthermore, their order follows a Motion Morpheme Hierarchy that is formed by the four types of motion morphemes. The hierarchy is given in (5), followed by a further interpretation.

(5) NonScalar change 飛 ‘fly’ → Open Scale 退 ‘recede’ → Multi-value closed scale 回 ‘return’ → Two-value closed scale 進 ‘enter’, 到 ‘arrive’

First, when two motion morphemes of different types co-occur in a MMMC, their relative left-to-right order in the MMMC must follow the hierarchy from left to right. For instance, the nonscalar change motion morpheme 飛 ‘fly’ belongs to the class located in the leftmost position of the hierarchy, so 飛 can precede any compatible motion morphemes which belong to the classes to the right of 飛 in the hierarchy, as in (6-9).

(6) the order of 飛 ‘fly’ and open scale motion morpheme 退 ‘recede’
   a. 向後飛退的黃土 (PKU Corpus)    b. *飛退

(7) the order of 飛 ‘fly’ and multi-value closed scale motion morpheme 回 ‘return’

The deictic motion morphemes 来 ‘come’ and 去 ‘go’ have diverse distribution in motion constructions. They do not always behave like typical motion when they co-occur with other motion morphemes, e.g., 来/去 in 跑進房間來 (Lin, in preparation). This paper does not include 来 and 去 in the analysis when they do not behave like typical motion morphemes.
Second, two closed scale motion morphemes do not co-occur. For instance, 回‘return’ is a multi-value closed motion morpheme and 进‘enter’ a two-value closed motion morpheme, but neither *回进房間‘return enter room’ nor *进回房間‘enter return room’ is acceptable in Chinese.

However, there are a few exceptions to the Motion Morpheme Hierarchy. First, 到‘arrive’ is a two-value closed scale motion morpheme (see Section 2), but it differs from other closed scale motion morphemes (e.g., 进‘enter’ and 出‘exit’) in that 到 can follow any type of motion morphemes, as in (10).

(10) 飞/退/回/进到学校

Second, the hierarchy in (5) does not predict the order of motion morphemes whose properties of scales are the same, that is, two morphemes of the same type. In Chinese, two morphemes of the same type are found to co-occur, but the morphemes usually denote exactly the same motion event. In other words, they are synonymous, as in (11).

(11) a. two nonscalar change motion morphemes: 飞翔‘fly-fly’, 奔跑‘run-run’
    b. two open scale motion morphemes: 坠落‘fall-fall’, 撤退‘recede-recede’
    c. two multi-value closed scale motion morphemes: 返回学校‘return-return school’, 穿过街道‘cross-cross street’
    d. two two-value closed scale motion morphemes: 进入房间‘enter-enter room’, 到达学校‘arrive-arrive school’

The order of synonymous motion morphemes is usually fixed, for instance, *翔飞‘fly-fly’, *退撤‘recede-recede’, *过穿‘cross-cross’, *入进‘enter-enter’. Only a few allow either order, e.g., 返回‘return-return’ and 回返‘return-return’ in (3). However, such constructions lexicalize a pattern different from MMMCs, thus not included in the study (See Chen & Yu 1979, Mao 2009, among others for discussion of their ordering).

4. Corpus studies verifying the Motion Morpheme Hierarchy

Two corpus studies were carried out to verify the Motion Morpheme Hierarchy.

4.1 Corpus study 1 and results

In this corpus study, all MMMCs were collected from selected chapters of four Chinese novels and investigated whether there are any MMMCs whose motion morphemes occur in an order inconsistent with the hierarchy. For convenience, motion morphemes from left to right in a MMMC are called M1, M2, M3, etc. respectively. For example, in 跑回房间‘run return room’, 跑‘run’ is M1 and 回‘return’ is M2. In
addition, because most Chinese MMMCs consist of two motion morphemes, the evaluation of the hierarchy was primarily based on two-morpheme MMMCs.5

The Motion Morpheme Hierarchy consists of four types of motion morphemes which are identified by three properties of scale, i.e. existence of a scale, boundedness, and punctuality. Therefore, each morpheme in a MMMC can be coded with the three properties: [+/- scale], [+/- bounded], [+/- punctual]. Furthermore, the hierarchy can be evaluated by examining whether the properties of motion morphemes are distributed in MMMCs in the way suggested by the hierarchy rather than by examining the morphemes themselves. To do so, three hypotheses based on the three properties were tested; the hypotheses are laid out in (12).

(12) If the Motion Morpheme Hierarchy is valid, then in a MMMC with M1 and M2, 
(a) M2 cannot be [–scale]. Specifically, if M2 is [–scale], M1 cannot be [–scale] or [+scale]; if M2 is [+scale], M1 can be [+scale] or [–scale].

(b) M1 must be [–bounded]. Specifically, if M2 is [–bounded], then M1 must be [–bounded]; if M2 is [+bounded], then M1 must be [–bounded].

(c) M1 must be [–punctual]. Specifically, if M2 is [–punctual], then M1 must be [–punctual]; if M2 is [+punctual], then M1 must be [–punctual].

For each property of a scale, two motion morphemes in a MMMC can have four possible combinations. For instance, in terms of [+/- scale], a MMMC consisting of M1 and M2 must be an instantiation of the following four combinations: (–scale, −scale), (–scale, +scale), (+scale, −scale), and (+scale, +scale). However, according to (12a), (–scale, −scale) and (+scale, +scale) are not acceptable in Chinese MMMCs. Table 2 lists all possible combinations of M1 and M2 in MMMCs with respect to their properties. The combinations marked with “?” are predicted not to exist in Chinese by the hypotheses.

Table 2: Types of (M1, M2) and their number of occurrences in data sources

<table>
<thead>
<tr>
<th>Existence of a scale</th>
<th>Boundedness</th>
<th>Punctuality</th>
</tr>
</thead>
<tbody>
<tr>
<td>(M1, M2)</td>
<td>(M1, M2)</td>
<td>(M1, M2)</td>
</tr>
<tr>
<td>(-scale, -scale):</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>(+scale, +scale):</td>
<td>221</td>
<td>194</td>
</tr>
<tr>
<td>(+scale, -scale):</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>(+scale, +scale):</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>231</td>
<td>231</td>
</tr>
</tbody>
</table>

Table 2 also lists the number of occurrences of each type of (M1, M2) found in the data. Among them, five types of (M1, M2) that are not predicted to exist by the hypotheses, (–scale, −scale), (+bounded, −bounded), (+bounded, + bounded), (+punctual, −

5 A total of 1,505 MMMCs are found in the two corpus studies carried out in the project. Of these MMMCs, 1,493 MMMCs consist of only two motion morphemes. The remaining 12 MMMCs consist of three motion morphemes, e.g., 踏回到桌子旁 ‘stroll return arrive table-side’. Investigation of each individual three-morpheme MMMCs found that the morpheme order in these MMMCs is consistent with hierarchy. However, no further discussion is given in this paper because of space limit.
punctual), and (+punctual, +punctual), do not occur in the four novels, which is thus consistent with hierarchy. MMMCs in the order of (+scale, -scale) are not allowed either according to the hierarchy. However, there is one instance of (+scale, -scale), 升飛 ‘ascend fly’, found in the novels. A closer investigation of the co-occurrence of 升 ‘ascend’ and 飛 ‘fly’ in the PKU Corpus indicates that the one instance of 升飛 ‘ascend fly’ is probably an arbitrary use by the author, because the corpus has 119 instances of its reverse order, 飛升 ‘fly ascend’, the order predicted by the hierarchy.

In addition to the 231 MMMCs in Table 2, 31 instances are found in which the closed scale motion morpheme 到 occurs after another closed scale motion morpheme. Such MMMCs are not predicted by the hierarchy (further discussion of 到 is given in Section 5). Except for 到, all other closed scale motion morphemes are not found to co-occur, which is consistent with the hierarchy.

### 4.2 Corpus study 2 and results

The purpose of Corpus Study 2 is to test the Motion Morpheme Hierarchy again by investigating MMMCs in a larger corpus, the PKU Corpus. In this corpus study, the most frequently used motion morphemes of each morpheme type found in Corpus Study 1 were chosen. These morphemes were then searched for in the PKU Corpus to investigate whether they and the motion morphemes they co-occur with follow the order predicted by the hierarchy. Table 3 lists the morphemes investigated.

Table 3 Motion morphemes to be investigated in Corpus Study 2

<table>
<thead>
<tr>
<th>Morpheme types in the hierarchy</th>
<th>Nonscalar change motion morpheme</th>
<th>Open scale motion morpheme</th>
<th>(Multi-value /two-value) closed scale motion morpheme</th>
<th>到 ‘arrive’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motion morphemes investigated</td>
<td>走 ‘walk’</td>
<td>上 ‘ascend’</td>
<td>回 ‘return’</td>
<td>到 ‘arrive’</td>
</tr>
<tr>
<td></td>
<td>跑 ‘run’</td>
<td>下 ‘descend’</td>
<td>出 ‘exit’</td>
<td></td>
</tr>
</tbody>
</table>

Figures 1-7 display the results of each motion morpheme searched for in the corpus. In each figure, there are three columns, with the middle column representing the key motion morpheme searched for in the corpus, the left hand column represents the number of occurrences of different types of motion morphemes that precede the key morpheme in MMMCs, and the right hand column represents the number of occurrences of different types of motion morphemes that follow the key morpheme in MMMCs. Figures 1-6 suggest that the distribution of the key motion morphemes in MMMCs is consistent with

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6 To make the manual analysis feasible, only the first 1,000 instances of each motion morpheme searched for in the novel category of the PKU Corpus were selected and analyzed. However, there are instances in which the morpheme searched for is not used in a MMC, or even not used as a motion morpheme, e.g., 回 ‘return’ used as a classifier (＝回 ‘three times’). Therefore, the numbers of MMMCs collected is much less than 7,000 (1,000 for each motion morpheme), as shown in Figures 1-7 below.

7 Multi-value closed scale motion morphemes and two-value closed scale motion morphemes (except for 到 ‘arrive’) do not co-occur, so they were grouped together as closed scale motion morphemes. Although the Motion Morpheme Hierarchy does not predict 到 to co-occur with other closed scale motion morphemes, we expect it to follow other closed scale motion morphemes. Therefore, 到 ‘arrive’ was investigated separately from other closed scale motion morphemes.
the Motion Morpheme Hierarchy. Figure 7 shows that 到 can follow any type of motion morphemes and thus should be treated as an exception to the hierarchy. Except for 到, two closed scale motion morphemes do not co-occur, as predicted by the hierarchy. The results of this corpus study further validate the Motion Morpheme Hierarchy as well as our observation that 到 is a special closed scale motion morpheme.

8 Different motion morphemes may have different preferences over a certain type of motion morpheme they co-occur with, although their distribution in the MMMCs is consistent with the hierarchy. For instance, 上”ascend”/ “descend” in this corpus study are found to only co-occur with nonscalar change motion morphemes (see Figures 3-4). However, these issues are left for future discussion due to the limited scope of this paper.
5 Discussion and concluding remarks

5.1 What does the Motion Morpheme Hierarchy tell us?

The study shows that motion events are primarily expressed by MMMCs consisting of two motion morphemes in Chinese. In addition, the M1 and M2 in a MMMC must follow one of the three orderings predicted by the hierarchy:

13. a. nonscalar change + open scale
    b. nonscalar change + closed scale
    c. open scale + closed scale

In all three types of orderings, M2 is always more specific than M1 with respect to information about scale. Specifically, in (13a), the M2 is more specific than the M1 in that the M2 indicates the existence of a scale in the motion event, whereas the M1 provides no information about scale; in (13b), the M2 is more specific than the M1 in that the M2 indicates that the motion event has a scale and the scale is bounded, whereas the M1 show no information about the scale; in (13c), although both the M1 and M2 indicate the existence of a scale in the motion event, the M2 is more specific than the M1 in that it specifies a bounded scale, whereas M1 shows no information about boundedness. Therefore, the ordering of motion morphemes in a Chinese MMMC conforms to the constraint that the morpheme that adds specific information about the scale must occur in the M2 position (cf. other accounts of morpheme order such as “resultative verbal compound” (Li and Thompson 1981, among others) and “Temporal Iconicity Condition” (Y. Li 1993)).

5.2 The incompatibility of two closed scale motion morphemes and the exception

Both multi-value and two-value closed scale motion morphemes lexicalize bounded scales. Therefore, in terms of degree of specification of information about a scale, a two-value closed scale motion morpheme is not more specific than a multi-value closed scale motion morpheme, or vice versa. However, a closed scale motion morpheme is able to express a single delimited motion event with independent components of motion, e.g., path, direction, and endpoint. A Chinese MMMC is not allowed to express two single delimited events, and thus two closed scale motion morphemes do not co-occur, conforming to the “Unique Vector Constraint” (Bohnermeyer 2003) and the “Single Delimiting Constraint” (Tenny 1994).
到‘arrive’ is a special motion morpheme in that although it lexicalizes a closed scale, it does not specify information about the direction in which a moving object moves to the reference object, nor what kind of reference object is involved in the motion event.\textsuperscript{9} When it co-occurs with another motion morpheme, it does not add a direction or a reference object different from the ones specified by its co-occurring motion morpheme (cf. Gruber 1965, Tenny 1994). Therefore, 到‘arrive’ is compatible with other closed scale motion morphemes.

To conclude, an analysis of motion morphemes based on their lexicalized scale structure provides a new insight into the morphemes’ distribution in Chinese MMMCs. Furthermore, the generalization underlying the ordering of Chinese motion morphemes might be extensible to MMMCs in other serial-verb languages, e.g., Thai, and Ewe, as well as Chinese multi-morpheme constructions in other domains, e.g., resultative verbal compounds.

References

\begin{enumerate}
\end{enumerate}

\textsuperscript{9} All other closed scale motion morphemes lexicalize specific information about direction of motion and physical properties of the reference object involved in a motion event (Lin to appear, cf. Rappaport Hovav and Levin 2010). For instance, 进‘enter’ expresses a boundary-crossing motion event from outside to inside of an enclosed region, whereas 出‘exit’ expresses a boundary-crossing motion event from the inside of an enclosed region to its outside.