

Spatial-temporal attributes in verbal semantics: A corpus-based lexical semantic study of discriminating Mandarin near synonyms of “*tui1*” (push) and “*la1*” (pull)

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Abstract

This paper proposes a new perspective to study verbal semantics based on the corpus-based study of near-synonyms. In particular, the author tries to discriminate the near-synonym “*tui1* (push)” and “*la1* (pull)” by investigating the literal collocations and metaphoric usages through the data extracted from the Chinese Word Sketch (CWS). The author applies both verbal semantic representation of MARVS theory and the spatiality-temporality attribute of metaphor concept as one of the newly added predictors to detect explicit and implicit attributes of verbal semantics. Specifically, the study integrates the MARVS theory with conceptual metaphor theory, and provides another perspective to discriminate near-synonyms. The results suggest that the spatial-temporal properties could be an additional predictor in MARVS theory, which could effectively study lexical semantics.

1 Introduction

Chinese synonyms are challenging in language teaching and learning. Sorting out the subtle differences of near-synonyms is fundamental to L1 speakers as well as L2 learners. Verbs are an

essential lexicon part of a language due to its lexical knowledge and argument frame (Liu, 2000).

Several attempts have been made to study the verbal semantics. Image schema is one of the methods that is believed to be the representation of the encoded meanings in our mind (Lakoff and Johnson 2003, Langacker 2008, Talmy 2000), which serves as models for comprehending more complicated and abstract items in a system of conceptual metaphors (Lakoff and Johnson 2003). Aiming at searching for the relation between the spatial component of verb semantics, scholars analyze action verbs and abstract verbs with a combination of image schemas and psychological experiments. The results show that a high degree of consistency among participants assigning orientation and direction of motion for each verb (Gao, 2016, 2020; Meteyard and Vigliocco 2009; Richardson 2001, 2003). However, other researchers suggest that language comprehension should include both mental perception and events developed in sequence, which means that verbs are dynamic simulations with spatial-temporal attributes (Bergen, Change and Narayanan 2004; Zwaan et al. 2002).

Corpus-based methods have been widely adopted to address verbal synonyms for providing rich data (Levin, 1995; Huang, 2000; Liu, 2000; Tsai, et al., 1998; Wang, 2018; Xiao, 2006). However, some scholars argue that semantic nuances are not explicit in the surface syntax but should be further investigated through conceptualization experiments (Gao, Wang and

Nicoladis, 2016). Yet, their research only focuses on spatial properties of the action verbs, neglecting other properties.

Given that there is a gap between the above methods, our study intends to integrate the spatiality-temporality feature into the MARVS theory, hoping to provide a better understanding of verbal semantics. The Module-Attribute Representation of Verbal Semantics (MARVS) theory is a powerful method to predict semantic representations of near synonyms (Huang, 2000), which could infer the eventive structure and role attributes from collocational behaviors. In the daily usage, verbs are not only used to depict the actual physical experience but also used in figurative expression. Hence, the study intends to adopt MARVS theory with the supplementary spatiality-temporality attribute to through a more powerful corpus Chinese Word Sketch (CWS) (Huang et al. 2005)

2 Research question

This study intends to explore the following questions:

- 1) How to interpret grammatical behaviors and meaning of “*tui1*” and “*la1*” with MARVS theory?
- 2) What are the fundamental properties of “*tui1*” and “*la1*” that differentiate the keywords?

3 Theoretical Framework

3.1 MARVS Theory

The theory of MARVS (Module-Attribute Representation of Verbal Semantics) is an approach to depict lexical knowledge of verbs (Huang, 2000), which could be categorized into two types: the event modules and the role modules. The former module consists of five atomic modules (see Fig. 1), and the latter one contains the role-internal attributes, like [sentience], [volition], [affectedness], etc. (Huang, 2015).

- (1) . Boundary (including a Complete Event)
Boundary is an event module that can be identified with a temporal point and that must be regarded as a whole.
- (2) / Punctuality
Punctuality is an event module that represents a single occurrence of an activity that cannot be measured by duration.
- (3) //// Process
Process is an event module that represents an activity that has a time course.
- (4) ____ State
State is a homogeneous event module in which the concept of temporal duration is irrelevant.
- (5) ^^^^^ Stage
Stage is an event module consisting of iterative sub events. [11, p. 26]

(Fig. 1 Huang et al, 2000, p26)

Through analyzing the argument structure of a verb, we may know the event structure. However, we still need to figure out the role of internal attributes. Some of the attributes are explicit, which could be detected by the argument structures. In cognitive-linguistic, verbs are considered as dynamic simulations with spatial-temporal attributes derived from spatial experience (Bergen, Change and Narayanan 2004; Zwaan et al. 2002). Hence, this study tries to find out if the spatial-temporal attribute could be a MARVS predictor that differentiates “*tui1*” and “*la1*”

3.2 Spatiality, temporality and the metaphoric meanings

Time and space are two elementary dimensions that construct our outside world. How we perceive the two elements reflect how we understand the world. According to Wang (2020), temporal attribute relates to the perception of the outside world with particular attention to temporal elements while spatiality represents the things we perceive with a focus on the spatial features. The inside world in our mind correlates with the outside world through language. Understanding language means not only a scene simulation but also events that develop in time sequence (Stanfield and Zwaan 2001; Zwaan et al. 2002). We comprehend abstract concepts with the help of the concrete ‘coherence’ by using metaphors, by which we can make better sense of our world (Zoltán, 2010). Spatiality and temporality are the thought patterns in our mind and could be reflected as attributes in language usage and metaphoric embodiment. Therefore, we may predict the sense of a word with the spatial-temporal feature.

4 Methodology

The study firstly checks the definitions of “tui1” and “la1” in the Chinese Wordnet (CWN). Then it retrieves the data concerning the two keywords from Word Sketch Engine (CWS) for analysis. Finally, based on the rich data from the corpora, the study will further discriminate “tui1” and “la1” with a conceptual metaphoric perspective to identify the lexical semantics.

The Word Sketch Engine (also known as CWS) is a powerful large-scale corpus where we can not only search for the usages of keywords but also compare the grammatical context and collocation of a word (Kilgarriff, 2004), which incorporates Concordance, word sketches, word sketch difference and thesaurus functions. The Word Sketch Engine incorporates several corpora: a) Sinica corpus, b) gigaword2all corpus, c) gigaword2cna, d) gigaword2xin, and e) gigaword2zbn. cna, xin and zbn respectively represent the sources in news media from Taiwan, Chinese mainland and Singapore, while gigaword2all means the combination of the above-mentioned three sources. By comparing the syntactic distribution and co-occurrence of “tui1” and “la1”, the author intends to deduce the argument structures, modules, and the attributes of these two verbs.

5 Analysis and findings

Chinese WordNet (CWN) provides Chinese sense division and the semantic relations of words (Huang et al., 2008). The basic definitions of “tui1” and “la1” given in Chinese WordNet are listed below:

推 tui1 (push)	用外力 “li4” (force)使物体或物体的某一部分顺着用力的方向移动	push, shove, thrust; concentrate strength in a forward direction to make an object or a part of an object move
拉 la1(pull)	用力 “li4” (force)使朝自己	pull, draw, tug, drag

所在的方向或跟着自己移动

Table 1 definitions of “tui1” and “la1” in CWN

From the table we may notice that both of the keywords are verbs of touching, which are related to “li4” (force) and its resultative movement differ in the direction: “tui1” refers to pushing an object forward or away oneself while “la1” means pulling an object towards oneself.

We search the keywords in gigaword2all corpus, the distribution of the PoS of “tui1” and “la1” are shown below.



Fig. 2 PoS of “tui1” and “la1” gigaword2all corpus of CWS

Obviously, from the results we know that both “tui1” and “la1” play the function as VC (Active Transitive Verb) in sentences. According to Huang (2000), verbal semantics are the mappings of means of grammatical realizations, in other word, lexical semantics information are based on event structure, the attributes of which must be attested by either of the following conditions: a) collocating structure, b) selectional constraints, c) distributional patterns. Thus, we need more information for the above-mentioned representational clues through other data from the corpora.

5.1 Event Modules: Structure and Attributes

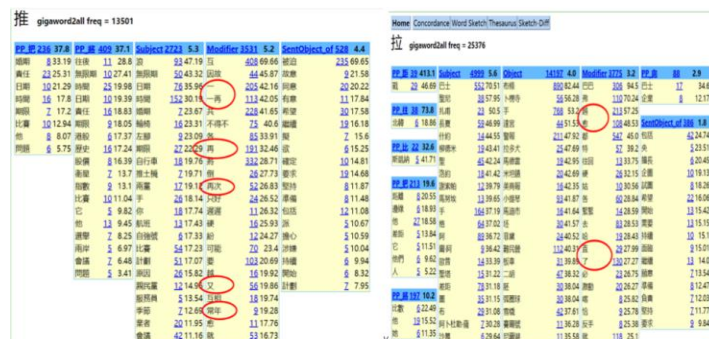


Fig. 3 collocates of “tui1” and “la1” using the “Word Sketch” tool

In Fig. 3, we can see that “*tui1*” is modified more often by adverbs like “一(yi1, once)”, “再、又(zai4, again; you4, again)”, “一再(yi 1 zai4, again and again)”, which means an activity with a beginning point as well as ending point of the process. But “*tui1*” can be also modified by adverbs “常年(chang2 nian2, perennial)” signaling temporal duration which can be measured by years. As for “*la1*”, we can see that it is more often modified by adverbs like “越, 愈(yue4, yu4; the more..., the more...)”, “(一)直(yi1 zhi1, always)”, which implies: a) degree or level during an event, b) temporal duration. Accordingly, “*la1*” acts more like a process with a clear beginning point but without the ending point.

We need more evidence from the corpora to verify the assumption. The results are shown in Fig. 4

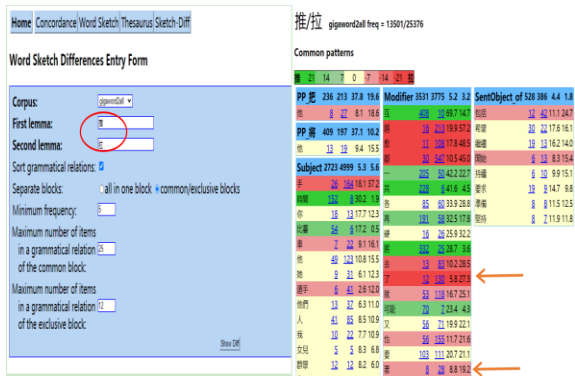


Fig. 4 Sketch-Diff tool and the results of Sketch-Diff of “*tui1*” and “*la1*”

From Fig. 4 we can see that “*la1*” is more frequently modified by “了(-le)”, which is a durational complement. Also, the durative “著(-zhe)” co-occur more often with “*la1*” than “*tui1*”. The differences suggest that “*tui1*” means an activity during which its motional path ends with a focus on one impact point, and “*la1*” denotes the pulling action with a focus on either prolonged contact or the motion towards touching (Huang, 2000 P37). In other words, “*la1*” is more like a process-oriented concept than “*tui1*”. Hence, those analyses could leave us to propose the event modules of “*tui1*” and “*la1*”: “*la1*” has process event module which contains a beginning point of

the activity; while “*tui1*” is more activity-alike. Thus, this study proposes that “*la1*” is of the Inchoative Process event type and “*tui1*” is of the Punctuality type, the account of which can be shown as follows:

“*tui1*” /
“*la1*” ● // // // //

5.2 Roles and Attributes

Spatiality and temporality in metaphoric extensions

Knowing how spatial and temporal expressions co-occur with a verb in the real world can enhance an understanding of the embedded properties of the word itself. In other words, we may know a verb’s usage by exploring its literal and metaphorical usages from the retrieved sentences of corpora (Dorr, 2018).

Spatiality and temporality could be understood as space and time concepts in our cognitive system. There are three kinds of cognitive function of metaphor, which are structural, ontological and orientational, and they often concur in some cases (Zoltán, 2010). In structural metaphor, the concept of time is built on motion and space, we comprehend time in terms of motion that contains direction (Zoltán, 2010). E.g., In the weeks following next Sunday..... In the example, time has a direction indicating moving forward. Spatiality is represented in space, which relates to human spatial orientations, like up-down, center-periphery, etc. Verbs denote actions or activities, which contains properties like movement, path or direction. Basing on the above discussion, the study tentatively proposes that spatiality and temporality in literal and metaphoric expressions could be inherited features of verbs, given that verbs are mostly used to describe motion or change.

Roles and Attributes

According to the Module-Attribute Representation of Verbal Semantics (MARVS) (Huang, 2000), lexicon knowledge contains two types of information: Event modules and Role Modules. The former includes semantic attributes related to event structure and the latter consists of role-related attributes. Verbs differ from each other with different eventive information (Ahrens, 2003).

The event type of the keywords has been discussed in the previous section, which leaves the role-internal attributes uncertain. To seek the fundamental feature that differentiates the keywords, we need to use Sketch-Difference to get the Common patterns and Only patterns (see in Fig. 5, Fig.6 and Fig.7).



Fig. 5 Sketch-Diff tool and the results of Sketch-Diff of tui1 and la1

"推" only patterns													
PP 把	236 37.8	PP 推	409 37.1	Subject	2723 5.3	Modifier	3531 5.2	SentObject of	528 4.4	Object	6391 3.1	PP 向	32 1.8
日期	8 33.2	往	11 28.8	推	92 47.2	因	44 45.9	被	235 69.7	嬰	47.5	社	2 14.6
責任	23 25.9	無	10 27.4	婚	50 43.3	一	113 42.0	放	9 21.6	婚	40 47.0	PP 在	29 1.1
日期	10 21.9	時	25 20.1	日	76 36.0	不	25 40.6	同	20 20.2	小	40 44.9	身	12 29.8
時期	16 17.8	日	10 19.4	期	2 23.7	個	26 27.7	有	11 17.8	嬰	18 44.0	Modifies	49 0.0
期限	2 17.2	責	16 18.8	婚	16 23.3	再	52 28.6	嬰	2 15.6	手	22 37.1	人	2 19.8
比	10 12.9	期	9 18.1	左	9 23.1	只	24 28.5	放	6 15.2	右	12 36.3	方	6 13.8
問題	6 5.8	港	6 17.4	期	22 22.3	運	11 26.3	確	10 14.8	門	11 36.2	式	6 13.8
		歷	16 17.2	自	18 19.8	粉	12 24.3	派	5 10.7	陣	9 35.6		
		股	9 16.4	推	2 19.7	印	18 19.7	讓	5 10.6	推	21 34.9		
		推	2 13.7	高	12 19.1	年	9 19.3	湖	5 10.0	行	13 34.3		
		推	9 13.3	推	13 17.4	暫	16 18.4	計	2 7.9	人	142 34.0		
		比	10 11.9	自	6 17.3	只	5 14.4			責	149 31.2		

Fig 6. Only patterns of "tui1"

"拉" only patterns													
PP 往	38 73.8	PP 將	197 10.2	Subject	4999 5.6	Object	14197 4.0	Modifier	3775 3.2	PP 向	80 2.9	PP 對	35 1.8
北	6 18.3	在	6 22.5	巴	552 70.9	布	892 82.4	巴	306 94.5	巴	17 34.6	高	5 20.3
PP 把	213 19.6	地	6 11.3	聖	38 57.9	卜	56 56.3	特	110 70.2	企	8 12.2	Modifies	267 0.0
能	9 20.6			扎	23 50.5	手	268 53.2	嬰	52 39.2	往	13 33.8	情	9 31.1
遺	6 18.9			長	59 47.0	達	44 51.5	往	13 33.8	必	5 23.5	英	8 25.2
差	5 13.8			什	14 44.6	警	211 47.9	站	10 30.6	公	6 20.4	公	10 8.8
它	5 11.5			柳	19 43.4	拉	25 47.7	驚	14 28.6	公	10 19.1		
他	6 9.6			聖	45 42.2	馬	19 42.9	哈	19 28.4	試	9 18.3		
人	5 5.2			洛	18 41.4	米	20 42.7	直	29 28.0	需	13 15.2		
				謝	12 39.8	美	16 42.3	必	23 26.7	滿	9 15.0		
				馬	13 39.6	小	32 41.9	動	20 26.3	離	2 13.5		
				格	64 37.0	馬	16 41.6	噶	8 25.8	離	2 12.0		
				噶	80 36.7	噶	30 41.6						

Fig. 7 only patterns of "la1"

6 Discussion

The patterns in Fig. 6 of "tui1" show us that the subjects and objects of "tui1" could be both concrete and abstract concepts, examples of which are shown in below:

Physical or concrete modifiers	like “浪(lang4, wave)”, “婴儿车(ying1 er2 che1,
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	stroller)”, “自行车(z14 xing2 che1, bicycle)”, etc.
Metaphoric or abstract modifiers	like “日期(ri4 qi1, date)”, “婚期(hun1 qi1, wedding date)”, “港股(gang3 gu3, Hong Kong Stock)”, etc.

In literal and metaphoric collocations of "tui1", the participants in the argument structure mostly relate to a) spatial items, like a forward direction; and b) temporal items, like events develop in time sequence. E.g., the literal expression “推婴儿车(tui1 ying1 er2 che1, stroller)”, in which the object (stroller) moves forward together with the agent by the force from the pusher. As in the figurative expression like “推港股(tui1 gang3 gu3, drive the Hong Kong Stock index)”, in which the object (HK stock) develops because of the power of the agent. In both cases, the movement caused by the agent involves a change of location (as in the “推婴儿车(tui1 ying1 er2 che1, push the stroller)”, which associates with a forward direction. Additionally, time is viewed as motion metaphor (Zoltán, 2010). E.g., in the expression “推婚期(tui1 hun1 qi1, postpone the wedding date)”, the wedding data is a time concept susceptible to Chinese cultural influences that it could only develop forward instead of moving backward. Hence, we can infer that "tui1" has a path specification with a focus on its forward direction and the theme role, which focus on the force/power applying to the object, has both the spatial and temporal role-internal attribute.

In Fig. 7, we can see that the subjects and objects could be also concrete and abstract, like the following examples:

Physical or concrete modifiers	or	like “巴士(ba1 shi4, bus)”, “手(shou3, hand)”, “小提琴(xiao3 ti2 qin2, violin)”, “距离(ju4 li2, distance), etc..
Metaphoric or abstract modifiers	or	like “差距(cha1 ju4, gap)”, “距离(ju4 li2, distance), “比数(bi3 shu4, scores)”, etc.

From the above results, it's not difficult to find that temporal related concept is less frequently used in “*la1*”, e.g., in the literal expression “拉手 (*la1 shou3*, hold hands)”, the literal/figurative expression “把距离拉 (*ba3 ju4 li2 la1*, enlarge/narrow the distance)”, the metaphoric expression “把比数拉(*ba3 bi3 shu4 la1*, getting higher scores)”, etc.. In the above collocations, the movement in “拉手 (*la1 shou3*, hold hands)” is stationary, which emphasizes the concept of spatiality. And the movement in “把距离拉(*ba3 ju4 li2 la1*, enlarge/narrow the distance)” involves a change of location, which associates with two directions: forward and backward (as in the case of moving forward to enlarge the distance and moving backward to narrow the distance). Basing on what we discussed, the direction of the action “*la1*” can be both forward and backward. In other word, the theme role attribute of “*la1*” is not temporal, for time or event only develops in one direction according to our common metaphors.

Also, in the only patterns of object of “*tui1*” and “*la1*”, the highest frequency of collocation object of “*tui1*” is “责任(*ze2 ren4*, responsibility)” and of “*la1*” is “手(*shou3*, hand)”, examples of which are shown in (1) and (2). In (1) the result of the object (responsibility) being moved away or forward by the force from the agent. In (2), the resultative outcome of the action from the agent is that the object (hand) moves toward or close to the agent. As we mentioned in the previous section, “*la1*” is of the Inchoative Process event type while “*tui1*” is of the Punctuality type. Both verbs accordingly could be encoded to involve a motional (path) semantic information (Huang, 2000). The theme for “*tui1*” has spatial-temporal attribute, which means the goal in the argument structure is to cause forward movement or an event development, resulting in longer/larger distance (e.g, schedule, flight information).The theme of “*la1*” focuses more on spatiality but with two direction, forward and backward, which means the goal in the argument structure of “*la1*” is to either cause backward movement or forward one, resulting in either shorter or longer distance.

(1) 工人 互 推 责任

gong1 ren2 hu4 tui1 ze2ren4

Workers each other push responsibility

“Workers blame each other.”

(2) 拉 女 学 生 的 手

la1 nv3xue2sheng1 DE shou3

Pull girl student's hand

“hold the female student's hand.”

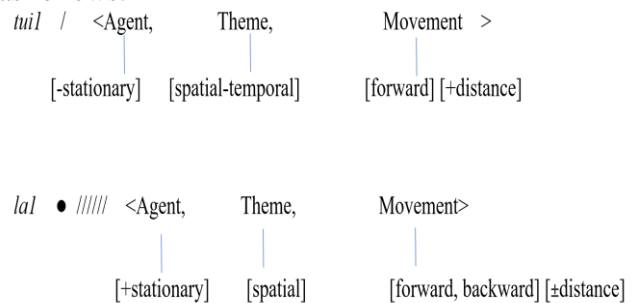
Additionally, this difference could be attested by the following examples extracted from the corpus:

(3) 推门 (*tui1 men2*, push the door)

(4) 拉小提琴 (*la1 xiao3 ti2 qin2*, play the violin)

In the common patterns of “*tui1*” and “*la1*”, “推门 (*tui1 men2*, push the door)” is only found in “*tui1*” instead of “*la1*”. The reason would be that people get used to moving things forward when they act in the same direction. The agent mostly likely moves in conjunction with the pushing event in the same direction. When playing a violin, the fiddlestick moves back and forth toward the player, who is more likely stationary during the act as a referent point. The intention, which can be encoded as the distance, may not be explicit in the above situation but the path encoded in the verb implicitly cause a resultant distance. Therefore, we assume that the role internal aspect of [distance] attribute describes the resultant movement.

The analysis leads the author to propose that the theme role and movement of an object (together with the [distance] attribute) receives an Event structure focus. Even though the attribute is implicit, role-internal, it is also “explicit” and can affect the event structure level. Therefore, the pair synonym of “*tui1*” and “*la1*” contrast both in their event structure and the role-internal levels, the account of which can be tentatively represented as follows:



7 Conclusion

By clarifying spatial-temporal properties as embedded attributes of verbs in cognitive linguistics, the author proposes that spatiality and temporality should be considered as the additional attributes of MARVS theory that differentiate synonyms, apart from the physical motion features of the verbs. The findings of the study are summarized as follows: a) through the different modifiers in the representation, the event-structure of “*tui1*” and “*la1*” can be accounted. “*tui1*” is of the Punctuality type while “*la1*” is of the Inchoative Process event type; b) as for the roles and attributes, “*tui1*” contains both the spatial and temporal attributes while “*la1*” only collocates with the spatial theme; c) there is a movement encoded in the semantic information of both “*tui1*” and “*la1*”, which causes a change in direction and distance between agent and participant. In “*tui1*”, the movement only involves forward direction and the goal is to increase the distance by moving it forward or away from oneself; in “*la1*”, the movement involves either forward or backward direction, through which a longer distance or shorter one will be achieved by being moved forward or backward the agent; d) the agent in “*tui1*” most likely moves in conjunction with the pushing event in the same direction while the agent in “*la1*” is relatively stationary as a referent point when the object moves toward it.

The findings of this study also suggest the following conclusions: a) Sketch Engine is a powerful corpus tool to study verbal semantics; b) MARVS theory with added spatial-temporality attribute is a useful and important tool to predict grammatical behaviors and metaphoric meaning of verbs.

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