

EMERGENCE OF CHINESE SORTAL CLASSIFIERS AND THE INTERACTIVE MODEL OF HUMAN CATEGORIZATION*

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The interdependences among linguistic classifications and categorizations have long been discussed; however, how the nominal classification are (inter-) connected with each other still not make a consensus (Senft 2000). In this paper, we construct an interactive model grounded on the prototype effects (Rosch and Mervis1975), experiential view of categorization (Johnson 1987, Lakoff 1987), and the model of intercategory continuity (Kleiber1990) to illustrate such connections. In this model, prototypes are represented as clusters of abstract features ranked with the conventional perspectives shared by language users; the interactions between sortal classifiers and nouns provide the crucial basis for the dynamicity of the model.

1. Introducing the issues

Classifiers in classifier languages¹ serve to classify and quantify nouns according to the semantic criterion that the nominal referents possess (Senft 2000). This function leads to a misconception that classifiers are ‘appendix’ to the respective nominal referents with simple or even empty semantic contents; however, though suffered from semantic bleaching to some extent, classifiers do themselves carry complex semantic features inherent from the original content usages². In Chinese³, the reality of the semantic features is evidenced by the

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¹ For classifier languages, here we adopt the defining characteristics made by Allan (1977): First, there exists a system of classifiers; second, an almost universal principle is observed: “A classifier concatenates with a quantifier, locative, demonstrative or predicate to form a nexus that cannot be interrupted by the noun which it classifies.” (Allan 1977:288) and third, the language belongs to one of the four classifier language types: numeral, concordial, predicative, or intralocative. Therefore under this definition, Chinese is one of the classifier languages.

² Corbett (1991) claimed that almost all classifiers come from nouns. However, it seems not to be the case: not all classifiers come from nouns, and for which come from nouns, the path might not be

semantic selections they impose on their nominal referents:

- (1) a. yi ba/ zhi/ *kuai / *tou shuzi
 one CL⁴ 把/支/*塊/*頭 comb
 ‘a comb’
 b. yi zhi/ gen/ *ba/ *tiao kuaizi
 one CL 支/根/*把/*條 chopstick

In (1a), the noun *shuzi* ‘comb’ can combine with the classifier *ba* [把] ‘handle’ and *zhi* [支] ‘stick’, but not *kuai* [塊] ‘chunk’ or *tou* [頭] ‘head’⁵. The ungrammaticality of the later two classifiers is due to the mismatching of the semantic contents with the noun *shuzi* ‘comb’, since the function or shape of the comb does not necessarily require the mental imagery (Langacker 2000) concerning ‘chunk’ or ‘head’. In (1b), the head noun *kuaizi* ‘chopstick’, does not tolerate the classifiers *ba* [把] ‘handle’ and *tiao* [條] ‘stripe’⁶, though the chopstick also has a long shape. The incompatibility of the noun *chopstick* and the classifier *tiao* reveals the complexity of the classifier-noun mapping mechanisms.

so straightforward. For example, most, if not all, classifiers in Kilivila (one of the Austronesian languages spoken in Milne Bay Province in Papua New Guinea) come from CPs; yet Kilivila CPs in turn originate in nouns (Senft 1996). Also, in Chinese, many classifiers come from verbs or verb-like elements, as we will see in the following sections.

³ Chinese in this paper refers to the variety spoken in Taiwan. Since the classifier systems are sensitive to the specific language users and communities, some classifiers shown in this paper might be different to the system used in Mainland China.

⁴ There exist lots of homophones in Chinese classifier systems, for example, *zhī* represents at least the following three common classifiers [支], [隻] and [枝], each of them bears the same phonetic representations and tonal behaviors, but different meanings; therefore to avoid misunderstandings, all Chinese classifiers would be labeled as CL, i.e. classifiers, while the corresponding Chinese characters would be marked as index. However, the other two varieties, namely Taiwan Southern Min (TSM) and Hakka, do not have an agreement in the use of characters. In order to avoid confusion due to the abundance of homonyms, we label the characters representing TSM lexemes based on two reliable dictionaries: *Taiwan Mminmanyu Cidian* (i.e. Dictionary of Taiwan Min Dialect, my translation), and the characters representing Hakka lexemes based on *Keyu Ciku* (i.e. Hakka Corpus, my translation); the former was edited in 2002 by National Institute for Compilation and Translation, and the latter was published in 2007 by Hakka Affairs Commission of Taipei.

⁵ In this paper we focused on the discussion of sortal classifiers, but not mensural ones (see section 2 for distinction); therefore we do not manage to translate the classifiers into English, since English do not require a system of sortal classification. In stead, we translate the meaning of the corresponding original content roots for reference. For example, classifier *tou* [頭] is hard to be translated into English, so we just put the original body part meaning of the noun *tou* ‘head’ as a reference. Basically the classifier *tou* [頭] indeed does something with the head. However, it does not use head as the measure of things (like ‘a head of’), but functions to emphasize on the feature of having a head. Therefore it always s-selects nouns meaning giant animals to make sure the saliency of the organ ‘head’ since giant animals always have big head in appearance. Similarly, sortal classifier *ba* [把] ‘handle’ does not equal to mensural usage ‘a handle of’, nor do *zhi* [支] ‘stick’ to ‘a stick of’, and *kuai* [塊] ‘chunk’ to ‘a chunk of’. We will discuss the applications of sortal classifiers in the next section.

⁶ See Tai and Wang (1990) and Wu (1991) for the detailed discussion of the classifier *tiao* [條] ‘stripe’.

However, the seemingly chaotic combination of classifiers and nouns only reflects one side of the perplexity; inconsistency, i.e. the heterogeneity of the nominal referents (i.e. one classifier links to more than one nouns) and the phenomenon of multiple classification (i.e. more than one classifiers link to one noun), makes the comprehension and acquisition of classifier systems even more difficult. For example, the nominal referents of *gen* [根] ‘root’ including at least the followings: ‘straw’, ‘hair’, ‘noodles’, ‘track’, ‘whip’, ‘bone’, and even ‘blood vessel’; while on the other side, ‘blood vessel’ can be classified not only by *gen* [根] ‘root’ but also by *zhi* [支] ‘stick’ and *tiao* [條] ‘stripe’, without changing the gestalt mental image of the blood vessel being discussed, though allowing certain alternations of user’s perspectives⁷.

To solve the mapping problems, firstly we have to construct the categorial structures of sortal classifiers and nouns, which are composed of clusters of semantic features ranked by relative importance according to user functions; then we have to find out the mechanism of the inter-categorial interactions among classifiers and nouns. With the mechanism we can therefore know more about the way classification works, namely, how the classifiers find the route (and with what norm) to subsume new referents and exclude old ones, and vice versa. These are the first two tasks we want to do in this paper.

Another goal of this paper is, by setting an interactive model of categorization for sortal classification, we manage to piece up the mechanism of human categorization. With the hierarchy of salient features, which can be analogized to prototypical examples, shared by speakers in the mutual selection of classifiers and referents, it is now possible to embody the asymmetries of in-category membership (Rosch 1973, 1975) and prototype-based categorization (Rosch and Mervis 1975). Therefore the relatively more abstract and inconsistent representations of prototypes can be substituted by a more concrete feature grouping systems.

Aside from introduction and concluding remarks, this paper consists of four parts: the next section discusses the distinction of Chinese sortal and nonsortal classifiers, the former being our main concern in this paper; In section three, we will discuss the possible motivations for emerging the usages of sortal classifiers, diachronically and synchronically. For the complex interactions between sortal classifiers and their nominal referents, we proposed a possible solution grounded on the concept of prototype- based model of human categorization (Rosch and Mervis 1975) and the experiential view of categorization (Johnson 1987, Lakoff 1987) in section four. Finally, some challenging examples which seem to be unpredicted by this model will be discussed in section five.

2. Distinguishing sortal and non-sortal classifiers

One general property of different kinds of classifiers is that they are morphemes

⁷ By saying “without changing the gestalt mental image”, we mean that the connection between classifiers and nouns would not alter the overall image (i.e. gestalt) of the referents. For example, in the case of ‘blood vessel’, mensural classifiers like *cong* [叢] ‘bush’, *cuo* [撮] ‘tuft’, or *shu* [束] ‘bundle’ will alter the gestalt image of the referent into more than one vessel; while sortal classifiers as we exemplified above apparently does not alter the amount of the vessel being represented.

that classify nouns according to semantic criteria (Senft 2000). However, despite this tendency, different types of classifiers may have divergent ways connecting with their nominal referents, different focus of semantic properties, and even distinctive syntactic behaviors⁸.

The most straightforward way of sub-classifying the classifiers might be to divide them into sortal and mensural classifiers⁹ (Lyons 1977):

- (2) Lyons (1977:463)
- a. Sortal classifier is a classifier which individuates whatever it refers to in terms of the kind of entity that it is.
 - b. Mensural classifier is a classifier which individuates in terms of quantity.

Along this line, Senft (1996) distinguished classifiers into classifiers and quantifiers:

- (3) Senft (1996:6)
- a. Classifiers classify a noun inherently.
 - b. Quantifiers classify a noun temporarily.

We can see the different approaches of Senft (1996) and Lyons (1977) from the term they adopted: the 'classifier' in Lyons's (1977) definition covered the sortal and the mensural classifiers, while in Senft's (1996) the same term only covered the one that "designate and specify semantic features inherent to the nominal denotatum and divide the set of nouns of a certain language into disjunct classes" (Senft 2000:21). Here we combine the idea of the two: we regard 'classifier' as a collective term covering the divergent usages according to Lyons (1977), and extract the members which classify nouns inherently (in Senft's sense) to be marked as sortal classifiers.

As for the sub-division of classifiers in Chinese, basically we follow Cheng and Sybesma (1998,1999) and Tang (2004, 2005) to classify them into [+sortal] and [-sortal] classifiers, but here we use this idea rather restrictively: by saying sortal classifiers, we consider those that are fit into the standard proposed by Senft (1996), but not the one made by Tang (2004, 2005)¹⁰, since the latter

⁸ However, compared to the two general properties of classifiers, this further sub-classification, though proved to be real in Chinese, does not need to exist in other languages having classifiers. As Senft (2000:23) put "A subclassification into categories like 'quantifiers' and 'classifiers' or 'sortal' or 'mensural classifiers' can only be accepted if there are distinctions in form that clearly indicate that the respective language itself differentiates between these categories." Therefore a syntactic or distributional distinctive representation is crucial in such subclassification.

⁹ Many Chinese linguists divide classifiers into more finely-grained subgroups, partly because of the prevalence and abundance of classifiers in Chinese, and partly because classifiers in Chinese could modify not only nouns, but also verbs or adjectives. The sortal classifiers we manage to deal with in this article are similar to the concept of 'individual classifiers' in Chinese, and non-sortal classifiers to 'non-individual classifiers' or 'mensural classifiers'. Basically, we just discuss the classifiers which combine with nouns, i.e. nominal classifiers.

¹⁰ Tang (2004, 2005) claimed that the [±sortal] distinctions not only exist semantically, but also syntactically, so sometimes semantically [+sortal] classifiers can tolerate syntactically [-sortal] behaviors, and vice versa, as the example showed (Tang 2005: 436):

involved some complexities that might not relate to our model so far; therefore for ease of discussion, we just leave aside the details of Tang (2004, 2005) for the time being; instead, we will use the concept [+sortal] to mean classifiers that individuate nouns inherently. For the discussion of Chinese nonsortal classifiers, we will focus on the mensural classifiers for their relatively high-frequency of occurrence in nonsortal classification to nominal referents.

2.1 Semantic differences

Chinese classifiers are grammaticalized from content words, for example, nouns or verbs; some nominal or verbal usages are still active now, coexisting with their homonymous classifiers:

(4)

		Content morpheme		Classifiers
張	a.	<i>zhangkai yanjing</i> open eyes 'open eyes'	a'	<i>yi zhang zhuozi</i> one CL _張 desk 'a desk'
把	b.	<i>bawo jihui</i> catch chance 'catch the chance'	b'	<i>yi ba daozi</i> one CL _把 knife 'a knife'
條	c.	<i>gang tiao</i> steel stripe 'steel girder'	c'	<i>yi tiao shengzi</i> one CL _條 rope 'a rope'
枝	d.	<i>shu zhi</i> tree branch 'a branch/branches'	d'	<i>yi zhi qianbi</i> one CL _枝 pencil 'a pencil'

(4a-b) are the verbal usages, and (4c-d) are the nominal ones; despite the different grammatical categories, those content morphemes share some of the semantic features with their classifiers. We have exemplified in (1a-b) that such

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- (1) a. [liang ge] (*-de) ren
two CL DE man
'two men'
b. [san wei] (*-de) laoshi
three CL DE teacher
'three teachers'

- (2) a. [liang ben] (-de) shu
two CL DE book
(lit.) 'two books/books that are sorted in accordance with two in number'
b. [san zhi] (-de) bi
three CL DE pen
(lit.) 'three pens/pens that are sorted in accordance with three in number'

We agreed with Tang's (2004,2005) observation that the[±sortal] distinction exist in different levels, but to avoid confusion to the readers, we restrict the [±sortal] idea to purely semantic ground here to facilitate the comprehension and explanation of our model.

semantic features of classifiers would restrict the choices of nominal referents; however, the imposition differs in degree and their way of implementation. For sortal classifiers, the persistent features directly project into the semantic composition of referents and find matching properties to do individualization. However, the features of mensural classifiers inherited from the content sources define a standard of measure, then be multiplied by information that the numeral words provide, and finally apply this container or volume to the referents, from which the matching units are obtained. The distinctive implementing strategies account for the degree of intimacy between the two types of classifiers and their nominal referents: sortal classifiers, as compared to mensural classifiers, stand closer to referents. To illustrate this difference, see the following examples:

- (5) a. *yi li fan* / **yi tiao fan* / **yi zhang fan* / **yi zhi fan*
 one CL_粒 rice one CL_条 rice one CL_张 rice one CL_枝 rice
 ‘a granule of rice’
- b. *yi wan fan* / *yi wan pingguo* / *yi wan xigua*
 one CL_碗 rice one CL_碗 apple one CL_碗 watermelon
 (lit.) ‘a bowl of rice/ apple (sliced or not)/ watermelon (sliced)’

In (5a), the semantic incompatibility resulted in anomalous phrases; while in (5b), the inappropriateness of the classifier-noun mapping just triggered an extra processing in communication: conventionally, a granule of rice is always smaller than the bowl, and an apple is smaller than or equal to a bowl, yet the watermelon without being sliced would definitely bigger than an ordinary bowl; in order to communicate successfully, the apple would often be modified as sliced pieces to fit into a bowl, but the watermelon would always be modified as sliced pieces to avoid the violation of cooperative principles in conversation. Therefore, the degree of feature tolerance as well as the effect of semantic imposition shows that the mensural classifiers have relatively looser relationship with referents than sortal classifiers.

Another difference between sortal and mensural classifiers is their ability to define the plurality of nominal referents. As the example above shows, *yi li fan* ‘a granule of rice’ always denoted to a single unit of rice, while *yi wan fan* ‘a bowl of rice’, though with the same numeral word, apparently marked the rice as plural. Except for the collocation with certain specific sortal classifiers¹¹, the numeral word *yi* ‘one’ adjacent to sortal classifiers generally does not need to

¹¹ When combined with *yi* ‘one’, most nouns classified by sortal classifiers have only one unit; however, plural features that certain sortal classifiers carry will increase the number of the entities referred. For example, *shuang* ‘pair’ is such a classifier. Yet conventionally *shuang* does impose more restrictions on referents than mensural classifiers: the referents of *shuang* basically are required to be ‘twin pairs’, that is, to be homogeneous in some sense. Besides, it is dubious that classifiers like *shuang* belong to sortal or mensural or both: on the one side, there are restrictions on inherent features as we just put; on the other, there seem to be quantity features in the semantic feature groupings of *shuang*. However, it is worth noticing that though the semantic status of *shuang* is unsettled, it seems that the modern usage of *shuang* tends to become more mensural-like: examples like *shuangying* ‘win-win situation’ or *shuangfang* ‘the two parties’ clearly do not require two similar entities to compose the referred pairs; rather, most of the time the two entities being referred to are opposite to each other.

contribute to the quantity of the nominal referents; instead, it just functions as a filler to complete the construction [Num+CL+Noun]. It is certain that when the quantity that the numeral words adjacent to sortal classifiers represent increases, the number of the referents would raise. However, it is only the number of the individuals, but not the sortal classifiers themselves, is being influenced by the increase of numbers; that implies that the increase of number gives to a direct copy of homogeneous or similar entities. On the contrary, numeral words adjacent to mensural classifiers are decisive: they amplify the volume that the mensural classifiers represent, and then apply this modified container to the nominal referents, and finally sorted out the entities fit in numbers. This gives to the following distinctions:

- (6) a. Mensural classifiers have a feature of quantity.
 b. Sortal classifiers do not have a feature of quantity.

This semantic difference implies the relatively closer relationship between mensural classifiers and numeral words, as exemplified in the order of compounding in (7):

- (7) a. [yi [li fan]]
 one CL_粒 rice
 'a granule of rice'
 b. [[yi wan] fan]
 one CL_碗 rice
 'a bowl of rice'

The equipment of the quantity features draws mensural classifiers nearer to the numeral words, as in (6b), and the lack of such features dissect them. It is no surprise that the semantic closeness also reflects on syntactic behaviors, as we will see in the next section.

2.2 Syntactic differences

The distinctive syntactic behaviors of sortal or nonsortal classifiers have long been existed: Wang (1990) and Ota (1987) both observed that around Qin Dynasty, the only legible context for individual classifiers¹² is the post-nominal position in the [Noun+Num+CL] construction, as shown in (8a); while the mensural classifiers, can appear prenominal (8b):

¹² Chao (1968) divided Chinese classifiers into nine groups according to their functions: (1) individual classifiers, (2) classifiers associated with V-O construction, (3) group measures, (4) partitive measures, (5) container measures, (6) temporary measures, (7) standard measures, (8) quasi-measures, and (9) measures for verbs. Among them, individual classifiers are like the sortal classifiers we discussed here, the examples of individual classifiers made by Zhang (1957) are *zhi* [隻/只], *ke* [個/个], *zhi* [枝], *jian* [件], *tiao* [條], *ding* [頂], *jian* [間], *suo* [所], and *zhuo* [座].

- (8) a. Zichan yi wo mu jiu zhang xing.
 Zichan with military tent-curtain nine CL_張 go
 ‘Zichan traveled with nine pieces of military curtains.’
 (*Zuochuan*, ZhaoGong, year third, i.e. 528 B.C.)
- b. yi dan shi, yi piao ying.
 one CL_簋 food one CL_瓢 drink
 ‘(only) a small basket of food and a small ladle of drink (for living)’
 (*The Analects of Confucius*, ‘Yongye’, around 285 A.D)

The structures of nominal phrases in (8a-b) are as follows:

- (8) a'. [[wo mu] jiu zhang]_{NP}
 military tent-curtain nine CL_張
- b'. [[yi dan] shi]_{NP}
 one CL_簋 food

It is interesting that during the same period, some of the verbal usages of certain individual classifiers behaved similarly to the classifier counterpart:

- (9) a. Gong zhang er bu chi.
 Bow draw-to-tension LINK NEG¹³ unstring
 ‘To draw a bow but let the arrow unstrung’
 (*Mozhi*, 1:7, San bian (The Three Arguments), around 480-420 B.C.)
- b. si wei bu zhang guo nai miewang
 four net NEG spread country then extinct
 ‘If the four laws were not to be put into practice, the country extinct.’
 (*Guanzi*, 1, Mu min (Cultivating the People), around 403-221 B.C.)

The grammatical distributions of different kinds of classifiers or verbs indeed worth further exploration; now we are just content with the fact that the historical evidences can argue for the fact that sortal and nonsortal classifiers behave differently in syntax.

To distinguish individual and mensural classifiers, Chao (1976) claimed that the individual classifiers, but not mensural classifiers, do not allow the insertion of *de* into the [Num+CL+Noun] construction, as shown in the following examples:

- (10) a. yi tiao (*de) yu
 one CL_條 DE fish
 ‘a fish’
- b. yi zhi (*de) qianbi
 one CL_枝 DE pencil
 ‘a pencil’

¹³ The index of the abbreviations in this article are as follows: LINK: linking marker, NEG: negative marker, DE: Chinese multifunctional linker. DOU: universal quantifier, POSS: possessive marker, PRN: pronominal expression, BE: copula, Q: interrogative pronoun.

- c. yi wan (de) fan
 one CL_碗 DE rice
 'a bowl of rice'
- d. yi hu (de) shui
 one CL_壶 DE water
 'a pot of water'

The insertion of *de* in both (10 a-b) are less preferred in the sorting reading, though the judgment might turn better in the measuring reading; however, the *de*-insertion in (10 c-d) is kind of free-variation: the meaning of the sentence does not change with the insertion. The acceptability of *de*-insertion just agrees with the semantic closeness we illustrated in (7).

As for the contemporary syntactic comparison between sortal and nonsortal classifiers, both Cheng and Sybesma (1998,1999) and Tang (1996, 2004, 2005) gave detailed analysis. Similar to Chao(1976)'s analysis, Cheng and Sybesma (1998,1999) distinguished sortal and nonsortal classifiers with the following two diagrams:

- (11) a. No *de*-insertion is allowed between sortal classifiers and the noun.
 b. An adjective is not allowed between the numeral and the sortal classifiers.

Examples are as (12) and (13) respectively (Cheng and Sybesma 1998,1999):

- (12) a. jiu *gen* (**de*) weiba
 nine CL DE tail
 b. shi *zhang* (**de*) zhuozhi
 ten CL DE table
- (13) a. yi (**da*) zhi gou
 one big CL dog
 b. yi (**da*) wei laoshi
 one big CL teacher

However, the degree of acceptability of *de* in (12) and the *da* in (13) is probably affected by the relevant semantic interpretations. For example, if the sortal classifiers have certain quantifying functions, which need not to be as strong as to define a novel mensural classifier, the paradigms in (11a-b) can be violated¹⁴.

¹⁴ The relatively bad adjective-insertion in (13b) might be accounted for by nonlinguistic factors: since *wei* is a classifiers carrying features [higher status], and so is its referent 'teacher', it is less preferred to give degree adjectives before *wei* (This feature of the sortal classifier *wei* had been used in Tang (2004, 2005) to explain the incompatibility of *de*-insertion and *wei* (for example, Tang 2005: 436).); as a comparison, other classifiers might tolerate such usages, or sometimes even require the presence of such adjectives to complete the intended meaning:

- (1) Dou yi *(*da*) *ge* ren le hai-yao ren jiao
 DOU one big CL_人 person PERF yet-need person teach
 'Being such a mature person, it is incredible that he/she still needs to be commanded.'

Therefore it may be possible that the distinction between sortal and mensural classifiers is not clear-cut, but represented in a continuum.

To solve this problem, Tang (2005) proposed that Chinese classifiers have to be distinguished by the [\pm sortal] feature, and their similarities and differences are put as follows (Tang 2005: 456):

- (14) a. The *de*-less numeral-classifier sequence and the noun are of head-complement relation.
 b. The *de*-marked numeral-classifier sequence and the noun are of modifier-modifiee relation.
 c. Both [+sortal] and [-sortal] classifiers may project as heads or modifiers of (a-b).
 d. Both [+sortal] and [-sortal] classifiers are listed as CI in the lexicon.
 e. Classifiers are marked with m-features, c-features, and s-features.

The semantic closeness we mentioned in 2.1 conforms to Tang's (2005) point that the non-inserted structures are head-complement relation while the inserted structures are modifier-modifiee relation: generally speaking, head and complements are much closer in semantics than modifiers and modifiee; that is, there exists more semantic restrictions in the former than in the latter combinations.

Since we mainly focus on sortal but not mensural classifiers in this paper, we have to sort out the targets of our focus. Based on the researches above, this is the test we adopt: if the volume of a classifier increase after the adjunction of degree modifier *da* 'big', it is defined as more like a mensural classifier; on the contrary, if the volume of a classifier as well as the number of the referents does not increase under the modification of *da* 'big', it serves as a case of sortal classifier¹⁵.

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- (2) Na yi *(da) zhang zui hai zhen yin ren zhuyi
 That one big CL_張 mouth LINK really draw person attention
 'That big mouth is really eye-catching.'

Though it is arguable that the adjective *da* in (2) is base-generated there or be fronted from the modifying position directly preceding the head noun, the fact that adjectives can appear between Num and CL is validated. What is more important is, unlike adjectives preceding numeral classifiers like the one in *yi da wan fang* 'a big bowl of rice', the adjectives preceding sortal classifiers like (1) and (2) above do not modify the classifier itself, but the nominal referents, as the corresponding English translation shows. This also reveals the different syntactic behaviors of sortal and nonsortal classifiers.

¹⁵ However, this test does have some restrictions imposed by the semantic properties of the mensural classifiers, for example, the classifiers that presuppose a definite quantity, like *da* [打] 'a dozen of', *bang* [磅] 'a pound of', or *chi* [尺] 'an inch of'. The incompatibility of the degree modifier *da* and the mensural classifiers above is straightforward: if the volume of the quantifier is altered, the inherent semantic measurement would be under the risk to be cancelled. However, *shuang* [雙] 'pair/a pair of' can escape from this fate because of the reason we have already discussed in footnote 11.

(15)

a. Examples and test result of sortal classifiers

a1	yi zhi niao one CL _隻 bird 'a bird'	a1'	yi da zhi niao one big CL _隻 bird 'a big bird'
a2	yi duo yun one CL _朵 cloud 'a cloud'	a2'	yi da duo yun one big CL _朵 cloud 'a big cloud'
a3	yi ben shu one CL _本 book 'a book'	a3'	yi da ben shu one big CL _本 book 'a big book'

b. Examples and test result of mensural classifiers

b1	yi wan fang one CL _碗 rice 'a bowl of rice'	b1'	yi da wan fang one big CL _碗 rice 'a big bowl of rice'
b2	yi bei shui one CL _杯 water 'a cup of water'	b2'	yi da bei shui one big CL _杯 water lit. 'a huge cup of water'
b3	yi qun yang one CL _羣 sheep 'a herd of sheep'	b3'	yi da qun yang one big CL _羣 sheep lit. 'a herd (which is big) of sheep'

Though the paradigms in (11) seem to be too strong; they reveal some interesting distributional facts of sortal and nonsortal classifiers, which imply the approaching or departing from the prototypes.¹⁶ For example, with the adjunction of adjectives or *de*-marker, the sortal classifiers seem to become less-prototypical by tolerating a numeral reading. That means under the condition, the semantic properties of the sortal classifiers might undergo certain modifications, for instance, an addition of a temporary mensural features. If this deviation became permanent, a new mensural usages would emerge; with the occurrence of the emergence, the original sortal usages might maintain or not, depending on the vitality and activity of the features denoting to the inherent semantic features of nominal referents. Such emergence, being it emergence of new usages or new grammatical functions, happens all the time, diachronically or synchronically, as we will see in the next section.

3. Emergence of sortal classifiers

The emergence of sortal classifiers in our paper concerns not only about their diachronic grammaticalization processes, but also about the effect of the synchronic interactions between the sortal classifiers and their nominal referents. Different sortal classifiers might have different speed of grammaticalization; therefore contemporarily there would exist several distinctive layers, and based

¹⁶ See Biq (2002) for a detailed discussion of the classifier *ge* and the prototypes.

on which, the sortal classifiers further interact with each other or with the nominal referents to make their semantic feature groupings more generalized or shrunk: for the former, the novel usages of sortal classifiers emerge according to the modern way of perspectives shared by people who use them; and for the latter, the original connections with certain nominal referents weaken or even disconnect because of the decreased usage of the nouns or the changed saliency shared by people in a modern community, by which the linking of the nominal referents to other sortal classifiers is promoted and therefore the novel usages of the substitutive classifiers are emerged.

3.1 Semantic generalization of sortal classifiers

Our basic assumption in this paper is that, the essence of prototypes can be represented not only as a collection of concrete examples, like Brown's (1958) first-level items and the 'good examples' in Rosch and Mervis's (1975) experiments, but also a group of ranked features. This assumption helps to comprehend the semantic generalizations of sortal classifiers: first, what 'leaks' in semantic feature groupings of sortal classifiers is usually a few particular features, by which some restrictions are relaxed, and a chunk of nominal referents might be able to be subsumed into the scope of a certain classifier; second, the weakening features are mostly the low-ranked ones, for their receiving relatively less saliency; and third, the features that are generalized seem to have a tendency: they go from hyponyms to hypernyms¹⁷, that is, to move from subordinate terms which cover restricted concepts to superordinate terms, with which more and more nominal referents can be included.

The semantic generalization of sortal classifiers can be exemplified with *ba* [把] 'handle'. At the earlier stage, the nominal and verbal content usages which carry relatively concrete referential meanings coexisted:

- (16) a. *gong ba zhi tong zi*
 arch handle POSS bronze craft
 'the bronze craft of the arch handle'
 (*Mengzi*, 11:11, Gaozi)
- b. *Zhougong ba da yue, Zhaogong ba xiao yue*
 Zhougong take big axe Zhaogong take small axe
 'Zhougong took the big axe and Zhaogong took the small axe.'
 (*Shiji Shijia*, 33, Lu Zhougong Shijia 3rd)

However, ever since the very early stages, the metaphorical extension of *ba* is

¹⁷ Hopper and Traugott (1993) have pointed that in the process of semantic generalization or weakening of semantic contents, lexical items tend to move upper to superordinate terms (i.e. hypernyms), for example, for the superordinate motion *say*, *whisper* is the more specialized term and therefore is regarded as an subordinate term. In the same vein, in the grammaticalization process of nouns, beginners (e.g. *creature*, *plant*), life forms (e.g. *mammals*, *bush*), or generic items (e.g. *dog*, *rose*) would be selected as the more generalized meanings. This definition also agrees with the point Brown (1958) and Berlin (1974) made. Brown (1958) claimed a first level in acquisition and function, which is the basic level Hopper and Traugott (1993) referred to; and Berlin proposed from the data of Tzeltal that genus-level (folk-generic level) is the psychologically basic level.

observed; in (17a), the noun *ba* represented a state that the bow was stretched to an extreme tension, which implies the greatest effort to attack; in (17b), the verb *ba* is extended as ‘to control’ or ‘to handle’:

- (17) a. she zhi shi, zuo you man *ba*, er buneng zhong
 shoot PRN arrow left right full tension yet cannot hit-target
 ‘Shoot with arrows; however, the target could not be hit though the
 generals all stretched the bow to extreme tension.’
 (*Lüshichunqiu*, Section Ji, 11:3, Zhonglian)
- b. ranze houshi shu jiang *ba* Qingguo
 however offspring Q qill govern Qin (country name)
 ‘However, who will govern Qin in the future (after my death)?’
 (*Yanzichunqiu*, Volume 2, Neijian II, No. 19)

With the mechanism of metaphorical extension, the meanings which *ba* can represent were expanded, and the semantic restrictions *ba* imposed on the complements are reduced. However, the central concept of *ba*, that is, functions or activities with hands, does not crashed; rather, it was realized by various ways. For example, if we grasp something in hands, we can control it; this was the basis of the metaphorical extension in (17b). We can learn from the examples above that, no matter how many extensions occur, the central feature of a certain item would keep intact and bear influence on the follow-up extensions, this central feature is what we called ‘the most prototypical features in the feature clustering of a certain lexeme.’

It is interesting that at this very early stage there was also quantifier usages of *ba* [把] ‘handle’ but the grammatical functions are nouns rather than classifiers as we can see from the conjunctive structure in (18):

- (18) wo yixia wei chai zha, *ba* yishang wei shifeng
 Grip below BE firewood residue handful above BE donation
 ‘(Grains) that are less than the volume of gripping are useless, and those
 that are more than a handful should be donated to government.’
 (*Guanzi*, 74, Shan guo gui)

However, the prevalence of *ba* [把] ‘handle’ as sortal classifiers occurred around Han dynasty, as the sortal usage in the famous novel *Sanguozhi* showed:

- (19) ge chi yi *ba* mou, yi huo gongba zhi.
 each take one CL_# spear use fire attack PRN
 ‘Every one took a spear and burn it with fire to shoot (the enemy)’
 (*Sanguozhi*, Wushu: 58:13, Luxun)

Ever since then, the sortal usages of classifiers expanded quickly; similar to the content usages, the concept of ‘hand and hand-related function’ played an important role in the semantic generalization. The nominal referents which *ba* classified in several famous classic novels are listed below:

(20)

Title of the book	Year	Referents
Shui Hu Zhuan (All men are Brothers)	1111- 1117	<i>fu</i> 'axe', <i>jian</i> 'sword', <i>zhanqi</i> 'battle flag', <i>naogou</i> 'hook', <i>biaoqiang</i> 'spear'
Xi You Ji (The World of Xuanzang and Silk Road)	1500- 1582	<i>qingsan</i> 'light umbrella', <i>chahu</i> 'tea pot', <i>yi</i> 'seat', <i>suo</i> 'lock', <i>shaner</i> 'small fan'
Xingshi Yinyuan	1640- 1715	<i>xiaoshaozi</i> 'small ladle', <i>niezi</i> 'tweezer', <i>yaoshi</i> 'key'
Rulin Waishi	1701- 1754	<i>qi</i> 'flag', <i>jiang</i> 'paddle', <i>zheyang</i> 'umbrella'
Hong Lou Meng (Dream of the Red Chamber)	1784	<i>jianzi</i> 'scissors', <i>hutui</i> 'leg of fox', <i>dengzi</i> 'steelyard for weighing'

As we can see, the referents of *ba* [把] 'handle' ranged from weapons that can be held in hands (including big flags with a pole) to things that commonly featured a handle, like teapot or fan, to instrument of punishment which was used to compress fingers, and finally even to the leg of fox, simply because it was portable with a hand. Each time when a feature of the classifiers lost, or weakened, a group of nominal referents with similar interactive functions or features were subsumed. The new referents did not come into the mapping one by one, but group by group, featured by similar functions. Moreover, the specific functional features that *ba* [把] 'handle' originally carried, for example, to use palms but not fingers, faded out by profiling the feature grouping to a higher level functional generalization: 'use hand(s)'. That is the tendency we put at the beginning of this section: to go from subordinate features to superordinate features; by doing that, more and more categories would be connected to the generalized classifiers.

In particular, some entities do not bear any permanent features in common with the hands, like the leg of the fox; it is the interactive function of the leg and people holding the leg that provided the basis for classification. However, because the loss of some interactive function, i.e. we do not usually carry legs of animals with hands today, the leg of the fox no longer links to the classifier *ba* [把] 'handle', but to the general shape classifier *zhi* [隻] or *tiao*[條]. With this contemporary saliency shift, the old relationship weakened, and the new classifications emerged; this is what we are going to see in the next section.

3.2 Interaction among categories

In his discussion about the emergence of grammars, Hopper (1987) proposed that the construction of grammar is a dynamic and on-going process which negotiates all the time with the interactive functions and the experiences of people who use them. This observation also held true for the emergence of sortal classifiers, since the referents they can individualize are under a constant variation according to the changing saliency the users demand.

The change of the saliency has two possible outcomes: first, the original

mappings and the substitutive mappings coexist and contest with each other; and second, the original mappings just delinked, and the classifiers being substituted might die because of the lack of application, or they might change their feature composition to fit the need of other referents. The example of the first case is in (21a), and the examples of the second case are shown in (21b-c):

- (21) a. *yi fu / zhang hua*
 one CL_{幅/張} picture
 ‘a picture’
 b. *liang dao / *jing meimao*
 two CL_{道/*莖} eyebrow
 ‘two eyebrows’
 c. *yi tiao / *dao lu*
 one CL_{條/*道} road
 ‘a road’

(21a) shows that both *fu* and *zhang* are possible sortal classifiers for *hua* ‘picture’; the former matches better for framed pictures and the latter for unframed pictures. While in (21b), only *dao* [道] ‘route’ is used contemporarily; the sortal classifier *jing* [莖] ‘stalk’, which was once prevalent in Song Dynasty to combine with plants, hairs, and even eyebrows and whiskers (Chen 2003), does not serve as sortal classifiers nowadays. However, as we can see in (21c), the combination of *dao* [道] ‘route’ and the noun ‘road’, turns to be ungrammatical today, perhaps because the demand of dissimilation since the emergence of the compound *daolu* ‘road’, which equals *lu* ‘road’ in meaning. The semantic extension of *dao* [道] ‘route’ makes it be able to classify many things with long shape, while the referent *lu* ‘road’ which matches perfectly in inherent features just fails to maintain *dao* [道] ‘route’ as its classifier.

The competition or interaction among sortal classifiers only reveals one side of the complexity involved in sortal classification. The interactions of sortal classifiers and their nominal referents can also affect the members of nominal referents. For example, *duo* [朵] ‘prosperity’¹⁸, prototypically combines with flowers, like *yi duo hua* ‘a flower’; while when the feature ‘charming’ originally belonging to the noun ‘flowers’ feedback to the sortal classifier *duo* [朵] ‘prosperity’, it can be used to combine with beautiful and charming things, like ‘smiles’: *yi duo weixiao* ‘a smile’. The relationship of classifier *duo* [朵] ‘prosperity’ and *smile* does come from temporary metaphor, but the motivation of this metaphor is the interaction of features. If this metaphor is conventionalized, the feature ‘charming’ would become one member of the feature clustering in *duo* [朵] ‘prosperity’, and then further affect the application of *duo* [朵] ‘prosperity’ to other nouns, for example, *wanxia* ‘sunset’, or *zitai* ‘posture’.

¹⁸ This translation of *duo* [朵] is based on the original meaning of the noun 朵: in *Shuowenjiezi*, it was defined as ‘the appearance of staked trees and branches.’ And the explanatory notes by Duan yu cai said ‘the prosperity of trees and leaves are called 朵朵, while today we also define a flower as a 朵.’

(22) The classification of *duo* [朵] ‘prosperity’

STAGE 1 HEPERNYMYZE

Central meaning: prosperous trees → prosperous plants
[subsuming ‘flowers’]

STAGE 2 PROFILING A PROTOTYPICAL FEATURE

Central meaning: 1. flowers ...n. other prosperous plants
[excluding ‘trees’]

STAGE 3 BACKWARD TRANSMISSION OF NOMINAL FEATURE

Central meaning: 1. flowers 2. charming and beautiful...
[subsuming beautiful things, like ‘smiles’]

Moreover, some usages of sortal classifiers are emerged from the transmission of features among nouns. Take *gen* [根]‘root’ for an instance. The noun *gen* originally refers to the root of trees, and quickly expands to plants which have apparent roots, like grass. Then the feature of ‘growing up’ of plants which have roots become superordinate and ranked higher in the cluster of prototypical features of *gen* [根]‘root’; this step subsumes lots of nominal referents into the connection with *gen* [根]‘root’, like ‘hairs’ and ‘vessels’. So far the features of *gen* [根]‘root’ and its referents are still related to each other. However, the nouns like ‘rubber bands’ and ‘strings’ which correlated with ‘hairs’ and ‘vessels’ by features of similar shape, i.e. lengthy, soft, and able to be curled, then access to the sortal classifier *gen* [根]‘root’, resulting in a combination of classifiers and nouns whose mutual resemblance is very little.

(23) The classification of *gen* [根]‘root’

STAGE 1 HYPERNYMIZE I

Central meaning 1: trees with roots → plants with roots
[subsuming ‘grass’]

Central meaning 2: trees with straight shape → straight and long
[subsuming ‘sticks’ and ‘tubes’]

STAGE 2 HYPERNYMIZE II

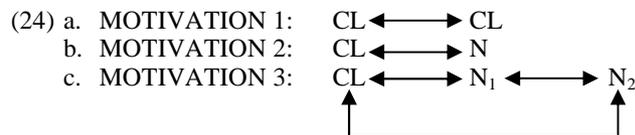
Central meaning 1: plants with roots → things with roots
[subsuming ‘hairs’ and ‘vessels’]

Central meaning 2: NA

STAGE 3 INDIRECT CONNECTION

[subsuming ‘rubber bands’ and ‘strings’]

Hence the motivations for the change of the semantic features and the emergence of novel usages of sortal classifiers can be illustrated as below:



The concept of the feature transmission and the change of saliency is our central concern in the interactive model for human categorization. In the next section,

we will use this model to integrate the phenomenon we have observed above.

4. The interactive model

Most Chinese sortal classifiers, if not suffering from semantic bleaching too seriously, reflect the way people characterize things; this is what we based on when we managed to use Chinese sortal classifiers to build an interactive model of human categorization. We found that the characteristics of human categorization, including family resemblances, hierarchically arrayed features (both by Wittgenstein 1989), central and non-central membership (Berlin and Kay 1969), the existence of prototypes and their being reference points in recognition (Rosch and Mervis 1975), and the effect of user's idealized cognitive model to categorization (Lakoff 1987), all play important roles in constructing the interconnection of sortal classifiers and their nominal referents. Therefore, in order to embody the interconnection, we first use the concepts of human categorization to build a model of sortal classification; then, with this model and the interactive mechanisms, we hope to be able to contribute to the illustration of the possible structures of prototypes, and the intracategorical interactions in human categorization. We will divide this section into three parts: the first is a brief introduction of the basic assumptions and characteristics of human categorization; it is followed by a simulation of a prototype-based model of Chinese sortal classification; finally we will apply this model to some Chinese sortal classifiers to see how the interactions work in this model.

4.1 Basic characteristics of human categorization

The classic view of human categorization is that, features in categories have shared properties, and categories are defined with clear boundaries. This view was challenged since Wittgenstein's famous observations that members in a category are not defined by common properties, but by family resemblances, as Fig.1. shows:

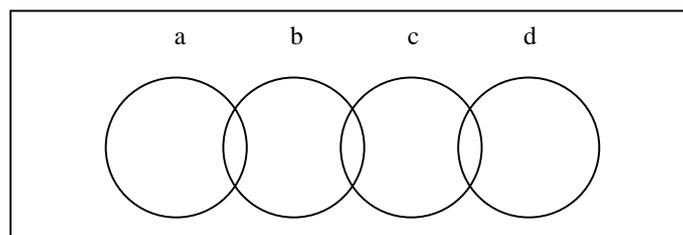


Figure 1. Givón's interpretation of Wittgenstein's categorial structure (Givón 1986: 78, re-adopted from Rúa, 2005: 91)

Intersections between members of the same category are not required to be the same; each one can be similar to one another in a certain feature, but this feature is not required to be shared by all category members. Therefore categorization

might result in a miscellaneous collection of items, which bear little in common with each other.

Lots of scholars contributed a lot to the nature of those ‘miscellaneous’ members, and found that actually they were not arrayed chaotically, but with certain regular representations: the items are not only hierarchically located in categories, some of them are even consistently focalized, and being the referent points for others. (e.g. Tayler 1989, Berlin and Kay 1969, Brown 1958, 1965)

For the internal asymmetries within categories, Wittgenstein claimed that members in a category bear hierarchical differences (Rúa 2005, Tayler 1989 and Moure 1996); further elaborations with a series of follow-up studies were made by, for example, Berlin and Kay’s (Berlin and Kay 1969) research on focal and non-focal colors; in their experiment, focal colors are recognized more readily regardless of the different cultural background of subjects. Therefore items are not only hierarchically put in a category, they are also divided into central and non-central groups, and the central ones have greater cognitive salience. Moreover, Rosch (1973, 1975) promoted the concept of prototype-based categorization from several experiments designed to test the goodness-of-examples, and resulted in scales of representativeness in a certain category; for example, robins are judged to be more representative than chickens in the category BIRD, and desk chairs are more representative than rocking chairs in the category of CHAIR (Rosch and Mervis 1975). The asymmetric status of prototypical and non-prototypical items makes prototypes become the reference points in cognition.

However, the two characteristics of prototypes seem to be contradicted with each other: firstly, prototypes seem to be ad hoc (Barsalou 1983) and hence shifting in nature; while at the same time, prototypes are important as their being cognitive reference points in many aspects, such as learning, matching, memory, and judgments of similarity as Rosch revealed (Rosch and Mervis 1975). However, if there exist at least two kinds of structures for categories, though both are centered by prototypes, this contradiction can be explained. The first one is what Rosch found to have concrete examples in prototypes, which are compatible with the idea of Brown’s (1958, 1965) basic levels¹⁹. The other is what we find in Chinese sortal classifier systems: the central features in the meaning clusters of Chinese sortal classifiers are not represented as concrete examples at all, but as an abstract prototypical image shaped and re-shaped all the time by their interaction with nominal referents, other classifiers, and the perspectives of humans who use them. This kind of feature composition in prototypes are in the same vein with Lakoff (1987) and Johnson (1987)’s experiential view, that is, image-schemas of people, which are inherent in everyday bodily experience with the environments. We will use this hypothesized prototypical structure made of hierarchically arrayed features instead of prototypes composed of basic-level items as examples or norms, to construct the internal structure of classifiers; as we will see then, the heterogeneity of the prototypical members of sortal classifiers would make it

¹⁹ Lakoff (1986:32) summarized Brown (1958, 1965)’s idea of first levels (or basic levels) as: the level of distinctive actions, the level that is learned earliest and at which things are first named, at which things are shortest and used more frequently, and the level which is most natural of categorization, as opposed to a level created by ‘achievement of imagination’.

impossible to define those members as a collection of basic level items.

4.2 The basic cognitive frame of categorization: prototype-based construction

To build a structure for sortal classifiers, firstly we adopt Kleiber's (1990) ideas that lexical features are graded with centrality, and the prototypes are those which are coded with the most important features in the category. In Fig. 2, prototypes involve features from different members in a category; some members might give more than one feature to the prototypes; also, some members might donate features to prototypes of separate categories. This model reveals that interactions among categories might be made through feature exchanges, a fundamental idea of our interactive model. Therefore prototypes are not that ad hoc or superficial as Barsalou (1983) found; if they were, it would be difficult for people to reach consistent categorization or classification, which obviously contradicts to the fact. Rather, prototypes may be represented as clusters of features, and with appropriate schema settings, certain features would be profiled, by which the consistency of classification can be achieved.

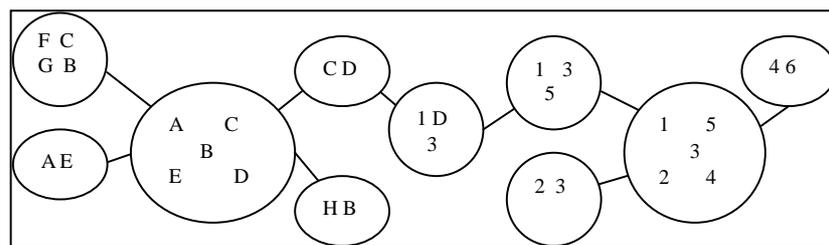


Figure 2. Intercategorical continuity in the standard version (Kleiber 1990)

For example, the widely discussed sortal classifier *tiao* [條] 'stripe' (Tai and Wang 1990, Tai 1994, Wu 1998, Li 1995) can demonstrate the great complexity of sortal classifiers. In particular, Tai and Wang (1990) exemplified the nominal referents of *tiao* [條] 'stripe' with three kinds of groupings by the way of semantic extensions:

- (25) a. Central members: *yu* 'fish' / *ku zi* 'trousers' / *tui* 'leg' / *chuan* 'boat' / *huang gua* 'cucumber' / *mao jin* 'towel' / *deng zi* 'stool'
 b. Natural extension: *jie* 'street' / *he* 'river' / *lu* 'road' / *ying zi* 'shadow' / *shang mai* 'mountain range' / *xian* 'line' (in a plane)
 c. Metaphorical extension: *xin wen* 'news' / *fa lu* 'law' / *yi jian* 'opinion' / *li you* 'reason' / *ming ling* 'order' / *hao sang zi* 'good voice' / *zhan xian* 'battle line'

The nouns of the central members map directly to the prototypical features of *tiao* [條] 'stripe', that is, in Tai and Wang's standard, the ones which have one-

dimensional ‘extension in length’ and relative flexibility²⁰. If we try the goodness-of-example test as Rosch and Mervis (1975) did, we will disappointedly find that except certain metaphorical extensions which might not be able to be conventionalized yet, almost all nouns would be selected as good examples of *tiao* [條] ‘stripe’. This implies a crucial distinction between the two kinds of categories: the one has concrete examples in prototypes, the other has abstract feature collections. For example, the highest-ranked feature of *tiao* [條] ‘stripe’ is one-dimensional ‘extension in length’, and there might exist other lower ranked features, like ‘relative flexibility’ (Tai and Wang 1990); those features would construct an abstract mental imagery (Langacker 2000) with long and flexible prominent features yet quite unstable in actual shape. With the observance of the high-ranked features, the concept of the classifier can alter to any shape and any size to meet speaker’s need, or, idealized cognitive model (ICM) in Lakoff’s (1987) sense. Therefore the scope of goodness would be very large.

Based on Kleiber’s (1990) model and Tai and Wang’s (1990) data, a preliminary illustration of the feature composition of *tiao* [條] ‘stripe’ is shown in Fig. 3²¹.

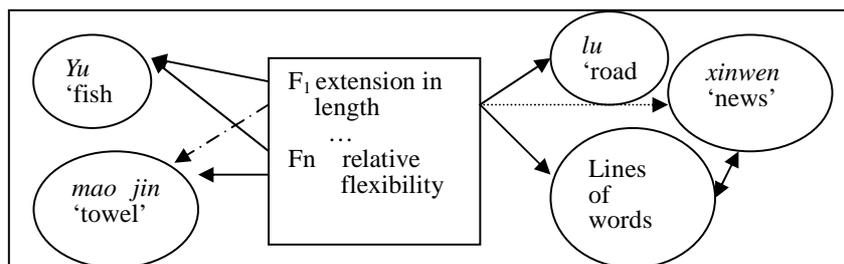


Figure 3. Prototype-based structure and feature connection of *tiao* [條] ‘stripe’

As we just observed, all examples, except some unstable metaphorical extensions, would be regarded as prototypical or good examples of *tiao* [條] ‘stripe’; Fig. 3. gave the reason for the phenomenon: because all of the nominal categories link to the highest-ranked feature (F_1) ‘extension in length’, be it in

²⁰ Our model also agree with Tai and Wang (1990) in that features are ranked, as they proposed that in Chinese the feature ‘length’ is always more salient than ‘consistency’; therefore when these two features both select a classifier, the one mapped to the feature ‘length’ would win out. For example, though both are able to modify lengthy things, *tiao* [條] ‘stripe’ is prototypical for the feature ‘length’ and *gen* [根]‘root’ is prototypical for the feature ‘consistency’. However, in Chinese, the frequency of *tiao* [條] ‘stripe’ is much more than *gen* [根]‘root’; moreover, unlike *tiao* [條] ‘stripe’, *gen* [根]‘root’ does not have rich natural extensions and metaphorical extensions. Those are supporting evidences for the fact that *tiao* [條] ‘stripe’ is ranked higher in saliency than *gen* [根]‘root’.

²¹ The variation of perspectives would definitely change the saliency in categories, be it categories of classifiers or nouns. It should put clear that because our focus here is the sortal classifier, we just skip the inner structure of nominal referents for the time being; however, the nominal referents do have their complex internal structures based on prototypes, but they might be represented as a more concrete collection of good examples, like the one Rosch and Mervis(1975) proposed, but not abstract features.

solid line or dotted line, all of them would be considered as prototypical. However, the linkages are not all in the same intensity and the same ways. The noun *yu* ‘fish’, which received two solid lines with one of them from F_1 , would be the most stable pair for *tiao* [條] ‘stripe’; the second prize would go to *lu* ‘road’, since though it receives only one solid line, it directly connects with F_1 . Unlike the solid lines, which represent relatively stable relationship like inherently inalienable features or unalterable properties, the dotted lines show weaker relationship between the two categories. For example, towels are not all the time interact with people in a long shape, sometimes they have to be staked, and sometimes be twisted; therefore the connection between *mao jin* ‘towel’ and *tiao* [條] ‘stripe’ is relatively unstable. This state of instability would make chances for other sortal classifiers to intervene, for example, *kuai* [塊] ‘chunk’ or *juan* [卷] ‘roll’. This classifier competition would not happen to the nouns linked to *tiao* [條] ‘stripe’ in solid lines²². The loosest relationship would be the one linked by indirect lines: *xinwen* ‘news’. At first, *tiao* [條] ‘stripe’ can only combine with *xian* ‘lines’ by natural extension. Then the concept of *xian* ‘lines’ extended to cover the lines made of words; however, notice that nevertheless there is no expression such as **yi tiao zi* ‘a line of words’. The linking of *tiao* [條] ‘stripe’ and ‘lines of words’, though not realized as [Num+CL+Noun] series, opens the opportunity for the noun *xin wen* ‘news’ to be able to link to *tiao* [條] ‘stripe’, because *xin wen* ‘news’ resembles to ‘a line of words’, and the latter further links to *tiao* [條] ‘stripe’; this is a situation of indirect connection we have put in (23), and also the example of family resemblance in Fig. 1.

Therefore prototypes are composed of ranked features which are shifting all the time: they are moving upwards or downwards in a hierarchy, or moving outwards or inwards among categories. Prototypes play an important role in our interactive model: they are abstract containers with a group of ranked features which define the gestalt image of the category, in our case, sortal classifiers. Features that are not included in the prototypes, or ranked lower in hierarchy, would under the risk of being shadowed when profiling a higher-ranked feature, as the feature ranked *n* we have seen in stage 2 of (22) showed. Such shadowing would also occur when certain higher-ranked feature is on the way to be generalized to hyponyms, but some lower-ranked features just block the process of generalization. For example, in (20), if the original specific content properties

²² One thing needs to be made clear is, for the noun *yu* ‘fish’, people of some dialects, or even some native Mandarin speakers, would like to use the classifier *wei* [尾] ‘tail’, but not *tiao* [條] ‘stripe’, or regard both of them as good. This is caused by cultural distinctive perspectives shared by a group of people. The information of the two kinds of choices would be recorded in both the noun *yu* ‘fish’ and the two distinctive classifiers for reference in equal status. However, such variation is different from the one of *mao jin* ‘towel’; the choice of the sortal classifiers of *mao jin* ‘towel’ is influenced by the way people interact with it, that is, different shape of function might play an important role in judging appropriate classifiers. While for *yu* ‘fish’, the change of saliency is not due to the alternation of shapes or other salient features, but which part of its body is being focused by a group of people conventionally. Therefore for the same entity *yu* ‘fish’, both *wei* [尾] ‘tail’, and *tiao* [條] ‘stripe’, and even *zhi* [隻] ‘a bird’ can be coded as F_1 ; while the most appropriate classifier for *mao jin* ‘towel’ might be judged by the ranked features each classifier donates: which one has F_1 compatible with the immediate function of *mao jin* ‘towel’, which one would be the better. Therefore we would not say the co-existence of *wei* [尾] ‘tail’, *tiao* [條] ‘stripe’, and *zhi* [隻] ‘a bird’ for *yu* ‘fish’ defines a competition.

of *ba* [把] ‘handle’, for example, using palms but not fingers, or being restricted to the size of a fist, do not fade away, the generalization ‘use hand(s)’ can not be achieved. As Langacker (2000) said, “Meaning is conceptualization.” Through the embodiment of the mapped concepts, we might get the access to the abstract feature groupings of sortal classifiers.

4.3 Applying the model

We have mentioned in (24) that there are three kinds of motivations for the emergence of sortal classifiers: the interactions between classifiers, the interactions between classifiers and their nominal referents, and the connections among nominal referents. We will use our model to illustrate how these interactions motivate the emergence of sortal classifiers.

The interactions among classifiers involve competitions. For example, in (21), we have seen three kinds of classifier interactions. The mappings of (21) would be illustrated with our model as in Fig. 4-6. In Fig. 4, though there are two sortal classifiers mapped to *hua* ‘picture’, both maintained its own specific function because they refer to different interactional functions, and to different semantic features. In Fig. 5, the two classifiers refer to the same prototypical

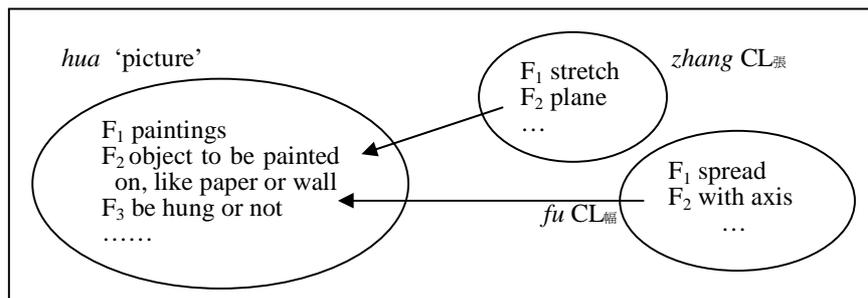


Figure 4. Classifier competitions: coexist.

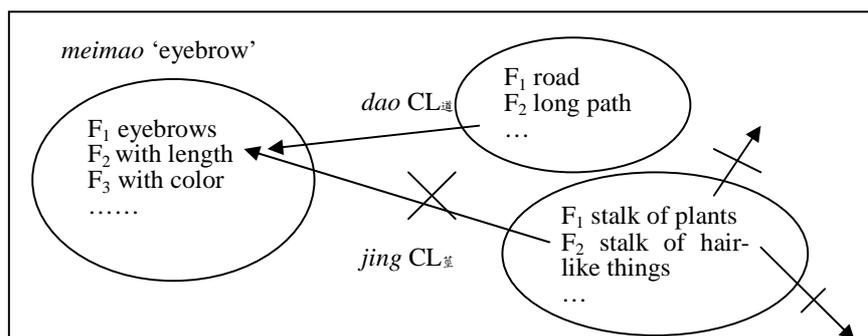


Figure 5. Classifier competitions: one wins, one dies.

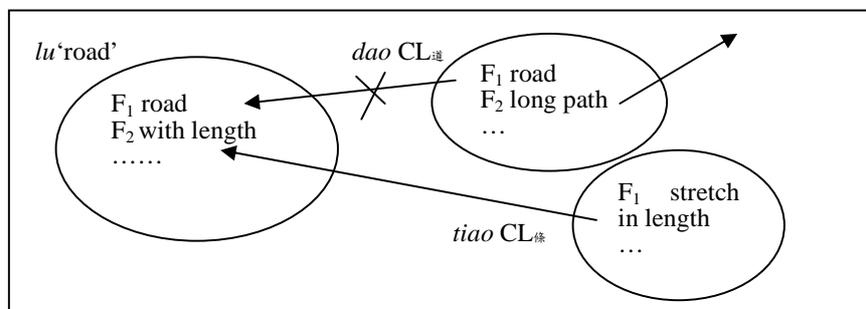


Figure 6. Classifier competitions: one wins, one changes.

feature of *meimao* ‘eyebrow’; as a result, the *dao* [道] ‘road’ wins out. However, because other applications of the classifier *jing* [莖] ‘stalk’ are also being substituted, the lexeme died as a classifier, though still exist as a noun. Finally, in Fig. 6, the original linking of *dao* [道] ‘road’ and *lu* ‘road’, though apparently a very strong connection due to the linkage of F_1 in both ends, surprisingly failed the contest because of the requirement of phonetic and conceptual dissimilation. However, it appears that the classifier *dao* [道] ‘road’ is still active and productive in other applications, so it is still available as a classifier, as Fig.5 shows.

As for the interaction of classifiers and nominal referents, take (22) for example; the inter-categorical feature transmission of *duo* [朵] ‘prosperity’ is illustrated in Fig.7.

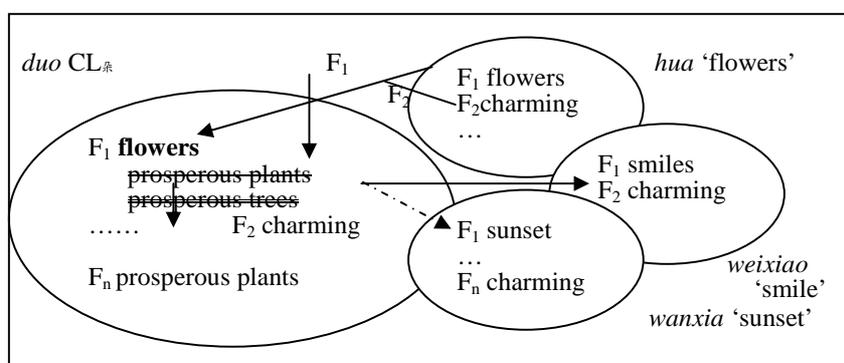


Figure 7. Feature re-ranking and inter-categorical feature transmission

As we have already stated in (22), there are three stages of interactions: first, the original semantic properties become hypernyms; second, the *hua* ‘flowers’, which are subsumed into *duo* [朵] ‘prosperity’ after the application of stage one, got profiled and donated the feature ‘charming’ to the *duo* [朵] ‘prosperity’; finally, the newly- acquired property ‘charming’ matched to other nouns which are considered charming conventionally (like *weixiao* ‘smile’) or selectively (like *wanxia* ‘sunset’); for this connection, the former is conventionalized and therefore more stable, so a solid line is adopted; while the latter is a value

depending on people's temporary perspectives or tastes, so a dotted line is adopted; so for those who do not agree that *wanxia* 'sunset' is charming, a relatively neutral classifier *pian* [片] 'slice' might be preferred.

The last connection we observed is the one linked among nouns, and this linkage would affect the behavior of sortal classifiers indirectly. (23) is an example of this kind of connection, and the illustration with the interactive model is in Fig. 8: at the preliminary stages, one of the highest-ranked feature 'trees with roots' went from subordinate features to superordinate features; then with the extended feature 'with roots', *toufa* 'hair' can be subsumed. Afterwards, through the connection of the feature 'soft and long' of *toufa* 'hair' and *xiangpijin* 'rubber band', a new linking of *gen* [根] 'root' and *xiangpijin* 'rubber band' is established, and a new usage of *gen* [根] 'root' emerges.

What needs to be clarified here is that, though mediated by nouns, the feature 'charming' and the feature 'soft/long' do not have equal status in the cases of *duo* [朵] 'prosperity' and *gen* [根] 'root': the former is much more internalized in the feature groupings of classifiers, while the latter is not, as Fig.7 and Fig.8 demonstrated. The two features differ from each other in their relative independence: for example, we do not say *yi gen yu* 'a fish' or *yi gen she* 'a snake', because the connections between the nouns featuring 'soft/long' and

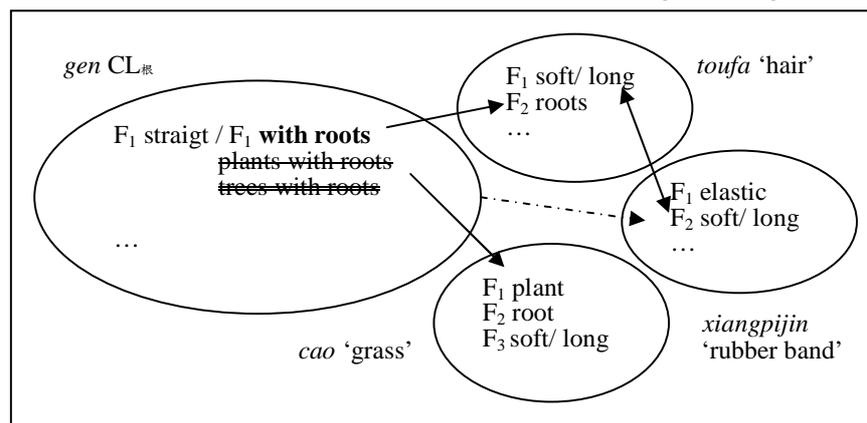


Figure 8. Indirect connection through nominal referents.

gen [根] 'root' is too weak, i.e. the feature 'soft/long' should be introduced by a media which bears not only the feature 'soft/long', but also the essential features mapped with *gen* [根] 'root'. However, the feature 'charming' is internalized into the feature cluster of *duo* [朵] 'prosperity' through the profiling of the feature 'flower'; therefore, anything that is charming can be linked to *duo* [朵] 'prosperity' metaphorically. Hence the feature 'charming' seems to be more independent than the feature 'soft/long', and that's the reason we treat them differently in the two figures.

Many people, especially foreign learners of Chinese or even teachers who teach Chinese regard the system of classifiers as notorious for its unpredictability; therefore the most sagacious tips for learning classifiers seem to be memorization. However, through the construction of the generalization paths and the linking mechanisms of classifiers and nouns, it might be possible

that the whole picture of classification would turn to be straightforward and easy to learn. To facilitate learning, the first step is to give learners the model of internal structure that could generate out the gestalt image of a certain classifier; then use feature mappings to search for suitable nouns for the classifier. This is the reversing way of conventional learning: usually, learners acquire a certain classifier when they learn nouns. The random acquiring of classifiers would reduce the efficiency of learning. Through overall and systematic exploration to classifiers, the learning could be facilitated. However, sometimes some irregular patterns would break the consistent mappings of classifiers; it is such irregularity that makes the acquiring of classifiers so difficult. In the next section, we will see two cases of such irregularities.

5. Under-prediction and over-prediction of the model

If the model we proposed above is not as useful as we expect, there might be two reasons, and both of them refer to the inconsistency with actual combinations of classifiers and nouns: on the one side, the model is under-predicted; on the other, it might over-predict some gapping combinations. However, at least for the two general cases we found below, solutions can be provided.

The representative case of under-prediction is the general sortal classifiers, which can combine with many heterogeneous nouns without considering the inherent feature rankings or compositions of classifiers. For example, *zhi* [隻] ‘a bird’ is such a classifier. To accommodate to the contemporary grammatical requirement that a noun must be preceded by a classifier when occur with numerals, *zhi* [隻] ‘a bird’ is widely adopted as a general classifier; the entities it can combine are exemplified in (26).

- (26) a. *chibang* ‘wing’, *erduo* ‘ear’, *xie* ‘shoe’, *yanjing* ‘eye’
 b. *chong* ‘insect’, *niao* ‘bird’, *xiang* ‘elephant’, *yu* ‘fish’
 c. *pingzi* ‘vase’, *langzi* ‘basket’, *wan* ‘bowl’, *chahu* ‘teapot’

(26a) map to the central meaning of *zhi* [隻] ‘a bird’, which originally means ‘one of a pair of birds’; the feature ‘one of a pair’ is maintained, while the restrictions on the entities of the pair are relaxed. Unlike (26b), the feature ‘bird’ decomposed from the feature ‘a pair of birds’ and generated to all animals, a sort of being hypernymized. Finally, in (26c), a further decomposition extracts the abstract size feature of the feature ‘bird’, by which a group of things featuring the similar size of bird, i.e. a size which is also the user-friendly size in interactions, are subsumed. Therefore the connections between the nouns and the classifiers are not arbitrary, but demand more efforts to trace back, partially because of the mutual dissimilarity at the two ends of the chaining connections. However, if the decomposition of the features and the follow-up hypernymization applies recursively, it is possible that at last no one consistent feature can be recognized among classifiers and nouns; ‘*ge*’ [個] is such an example which is on its way to the extreme grammaticalized end, that is, to bear relatively empty semantic features inside with a status of being grammatical linker or filler. However, when a classifier grammaticalizes to its end, it is

natural that no semantic mapping can be achieved due to acute semantic bleaching during the grammaticalization process. Therefore such classifiers would not be concerned here.

The other possibility of inconsistency is over-prediction. For example, *tiao* [條] ‘stripe’ is a classifier that seems to go through the process of hypernymization: the feature ‘aquatic lengthy animal’ of *yu* ‘fish’, generalized to the hypernym ‘animal’, and therefore apply to many animals. However, some irregular patterns exist; for example, we say *yi tiao gou* ‘a dog’, but not *yi tiao mao* ‘a cat’ in Chinese. It is quite unexpected since when we exemplify four legged animals, dogs and cats would both be rated as good examples and therefore equal as being basic level terms. The irregular pattern would make our feature-setting mechanisms seem to be too powerful.

However, dialectal differences might provide us with a possible solution. In Hakka, all four-legged big animals would combine with *t^hiau* [條] ‘stripe’, including dogs; while all fowls, including cats, are classified with *tsak* [隻] ‘a bird’. It is interesting that the use of *t^hiau* [條] ‘stripe’ in Chinese and Taiwan Southern Min (TSM) is rather restricted: in the following chart, the only one animal combined with *tiau* [條] in TSM is ‘fish’, and in Chinese the only two are ‘fish’ and ‘dog’; however, all of them can be further combined with other classifiers, like *zhi* [隻] ‘a bird’ and *we* [尾] ‘tail’ in Chinese and *chiah* [隻] ‘a bird’ and *boe* [尾] ‘tail’ in TSM.

(27)

Nouns	Chinese	TSM	Hakka
dog	<i>tiao</i> [條]/ <i>zhi</i> [隻]	<i>chiah</i> [隻]	<i>t^hiau</i> [條]
cat	<i>zhi</i> [隻]	<i>chiah</i> [隻]	<i>tsak</i> [隻]
deer	<i>tou</i> [頭]/ <i>zhi</i> [隻]	<i>chiah</i> [隻]	<i>t^hiau</i> [條]
bear	<i>tou/zhi</i> [隻]	<i>chiah</i> [隻]	<i>t^hiau</i> [條]
horse	<i>pi</i> [匹]/ <i>zhi</i> [隻]	<i>pit</i> [匹]/ <i>chiah</i> [隻]	<i>t^hiau</i> [條]
tiger	<i>tou</i> [頭]/ <i>zhi</i> [隻]	<i>chiah</i> [隻]	<i>t^hiau</i> [條]
lion	<i>tou</i> [頭]/ <i>zhi</i> [隻]	<i>chiah</i> [隻]	<i>t^hiau</i> [條]
fish	<i>tiao</i> [條]/ <i>zhi</i> [隻]/ <i>we</i> [尾]	<i>chiah</i> [隻]/ <i>boe</i> [尾]/ <i>tiau</i> [條]	<i>t^hiau</i> [條]/ <i>mi</i> [尾]
worm	<i>zhi</i> [隻]	<i>chiah</i> [隻]/ <i>boe</i> [尾]	<i>mi</i> [尾]
mouse	<i>zhi</i> [隻]	<i>chiah</i> [隻]	<i>t^hiau</i> [條]
chicken	<i>zhi</i> [隻]	<i>chiah</i> [隻]	<i>tsak</i> [隻]
duck	<i>zhi</i> [隻]	<i>chiah</i> [隻]	<i>tsak</i> [隻]
goose	<i>tou</i> [頭]/ <i>zhi</i> [隻]	<i>chiah</i> [隻]	<i>tsak</i> [隻]
frog	<i>zhi</i> [隻]	<i>chiah</i> [隻]	<i>tsak</i> [隻]

A possible motivation for the inconsistent mapping of ‘dog’ and ‘cat’ to *tiao* [條] ‘stripe’ is that, the use of *t^hiau* [條] ‘stripe’ in Hakka affect the choice of classifiers in Chinese partially: the mapping of ‘dog’ and ‘cat’ to *t^hiau* [條] ‘stripe’ and *tsak* [隻] ‘a bird’ is copied from Hakka to Chinese, but the other consistent correspondences are not. Therefore the pattern of the *t^hiau* [條] ‘stripe’ and *tsak* [隻] ‘a bird’ are still transparent and comprehensible, while the pattern of *tiao* [條] ‘stripe’ and *zhi* [隻] ‘a bird’ in Chinese are opaque. What seem to be worse is , the follow-up neutralization and generalization of *zhi* [隻] ‘a bird’ in Chinese further obscured the rationale of the sorting. Therefore the mapping between dogs and *tiao* [條] ‘stripe’ and between cats and *zhi* [隻] ‘a bird’ turns to be like random cases. As for the different standard of sorting in Hakka, non-linguistic factors might be able to provide the rationale. The asymmetric status of dogs and cats in Hakka can be well explained with the fact that since Hakka people mainly engage in farming for living, the dogs, conventionally regarded as loyal, brave, and smart, could be viewed the same with other big animals, like cows; while cats, which are negatively viewed as gloomy or capricious, could only get sorted as low-status fowls, like ducks and chickens. Therefore, with the premise that languages always contact with each other, and features recursively decomposed and generalized to cover more concepts, it should be more careful when we want to construct a clear emergence path or connections of classifiers.

6. Conclusion

In this paper we demonstrate an interactive model based on the experiential view and the schema-setting of Lakoff (1987) and Johnson (1987), the theory of categorization grounded on prototype effects (Rosch and Mervis1975), and the intercategory continuity illustrated by Kleiber (1990). With this model, we can draw connections among categories through the interactions of prototypical features; and the connections can further provide us with the traces of the classification of sortal classifiers. This model can also show the three kinds of motivations that introduce or delete the interconnections among categories: the interaction between classifiers, between classifiers and nouns, and indirect connections between classifiers and nouns introduced by mediated nominal referents. For the irregular connections of sortal classifiers and nouns that seem not to be predicted by this model, we provide analysis that can prove the long-distance correspondences by simulating recursive applications of feature decompositions and hyponymization (to become hypernyms) and use cross-dialectal datum to show the effect of language contact. This model can therefore exemplify the dynamic aspect of the categorial structures centered by abstract feature groupings but not by concrete basic level examples.

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