

The semantics of shapes:

A study based on Mandarin *quan1zi5* (圈子)*

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Abstract

*Mandarin shape nouns, such as a *fang1xing2* ‘square’ and *san1jiao3xing2* ‘triangle’, share a set of very interesting lexical semantic features. These nouns can refer to either the contour (i.e. the outside edge) or the enclosed area of a shape. In this paper, we will try to explain this lexical semantic fact in terms of the cognitive theories of grounding and visualization. Our study will focus on *quan1zi5* ‘circle’, which has the typical semantic behaviors of the shape nouns, but also allows two additional interesting meaning extensions.*

Keyword

shape noun, sense, sense distinction, meaning facet, gestalt theory, visualization

1. Background: The meaning of shape nouns

Shape is an instance of a visual configuration when people perceive or recognize an object (Zusne 1970). People name these visual forms in term of the stimulus properties that they identify. For example, a triangle is composed of three co-terminated lines that form three angles, and a circle is composed of a continuous curved line without angles. Mandarin shape nouns, such as a *fang1xing2* ‘square’ and *san1jiao3xing2* ‘triangle’, share a set of very interesting lexical semantic features. These terms can refer to either the contour (i.e.

* This paper is one of the results of our current project ‘Linguistics Anchoring’ (NSC: 92-2422-H-001-008). One goal of this project is to identify word senses for the Chinese lexicon. Hence, we will concentrate on the identification and isolation of individual senses in this paper, rather than on how they are represented in our mental lexicon. Our result will also be further tested in an on-going sense-tagging study by Professor S. J. Ker and Professor K. J. Chen. We wish to thank two anonymous reviewers and all participants of PACLIC 17, especially Professor Akira Ishikawa and Professor Jhing-fa Wang, for their useful comments and suggestions. We would also like to thank Professor Kathleen Ahrens for her comments and editing. Remaining errors are our own responsibility.

the outside edge as in Figure 1) or enclosed area of the shape as in Figure 2. By studying the semantics of shape nouns, we can examine the cognitive motivation of lexical conceptualization.

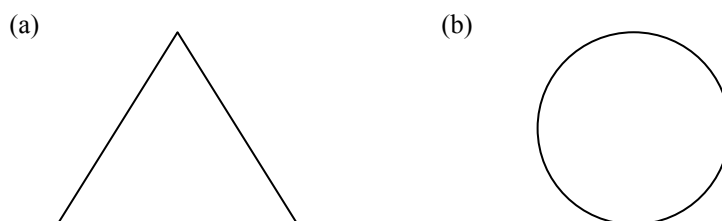


Figure 1. Examples of the shape terms that refer to the contour of the shape: (a) triangle, (b) circle.

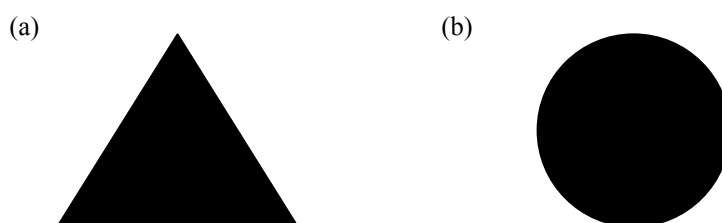


Figure 2. Examples of the shape terms that refer to enclosed area that the contour limits: (a) triangle, (b) circle.

In this paper, we will explain this lexical semantic fact both in terms of the cognitive theories of grounding and visualization. Our study will focus on *quan1zi5* ‘circle’, which has the typical semantic behaviors of shape nouns but also allows two additional interesting meaning extensions.

2. The meaning of *quan1zi5* ‘circle’: Data

Like all shape nouns, *quan1zi5* has the basic meaning of a circular contour, such as in example (1). It can also refer to an area which is enclosed by the circular contour, as in example (2). In addition, its area meaning can be extended metaphorically to refer to an area defined by human activity (3), or a set of related people which is often defined by their social strata (4). On the other hand, the linear contour meaning of *quan1zi5* can be extended to refer to a path where the end point coincides with the start point, as in example (5).¹

¹ The examples used in this paper are adopted and revised from data extracted from Academia Sinica Balanced Corpus of Modern Chinese. (<http://www.sinica.edu.tw/SinicaCorpus/>).

- (1) 他們 圍成 一個 圈子 跳舞
tamen weicheng yige quanzi tiaowu
they surround-be a circle dance
'They made a circle to dance.'
- (2) 你 只 能 站 在 圈子 內， 不 可以 跑出來
ni zhi neng zhan zai quanzi nei bu keyi paochulai
you only allow stand LOC circle inside NEG allow go out
'You can only stand inside the circle. Don't go out.'
- (3) 她 的 生活 圈子 就是 台大 和 公館
ta de shenghuo quanzi jiushi taida he gongguan
she DE living circle just NTU and GongGuan
'Her usual circle of activity covers just NTU (campus) and GongGuan.'
- (4) 她 在 美國 的 華人 圈子 很 有名
ta zai meiguo de huaren quanzi hen youming
she BE America DE Chinese-people circle very famous
'She is famous in Chinese society in America.'
- (5) 我們 在 山上 迷路 了， 一直 在 繞 圈子
women zai shanshang milu le yizhi zai rao quanzi
we at mountain lost-way LE always ASP circle circle
'We got lost on the mountain and were going around in circles.'

With the instances listed above, we can identify four meanings of *quan1zi5*: (1) a circular contour (example 1); (2) an area enclosed by the circular contour (example 2); (3) an area defined by human activity, which also refer to a social strata (example 3 and 4); and (4) a abstract path (example 5). Among these meanings, the first and second meaning have a physical and locational meaning, and the third and fourth meaning have more abstract and metaphorical meaning.

Moreover, like all lexical polysemy, ambiguity between the physical and metaphorical meanings of *quan1zi5* is attested. Example (6) illustrates three possible readings of *quan1zi5* in one sentence: the dancing circle itself (6a), the area that dancing circle encloses (6b), and a professional group (6c).

- (6) 因爲 跳 累 了，他 決定 離開 這 個 圈子
yinwei tiao lei le ta jue ding likai zhe ge quanzi
because dance tired LE he decide leave this CLASS circle
(6a) 'He decided to leave from the dancing circle (formed by dancers) because he is tired.'
(6b) 'He decided to leave the dancing area circle because of being tired.'
(6c) 'He decided to leave the dancing group because he is tired of all the dancing.'

3. Sense distinction of *quan1zi5*

3.1 Methodology

Ahrens, Chang, Chen and Huang (1998) proposed that lexical polysemy can be

distinguished into two levels: senses and meaning facets.² The lexical sense entails the following properties:

- (A) a different sense cannot appear in the same context (unless the complexity is triggered deliberately as in puns);
 - (B) a sense is not an instance of metonymic or meronymic extension, but may be an instance of metaphorical extension (Lin and Ahrens 2000);
 - (C) the link between two senses cannot be inherited by a class of nouns.
- On the other hand, a meaning facet has the properties as follows:
- (A) it can appear in the same context as other meaning facets;
 - (B) it is an extension from a core sense or from another meaning facet;
 - (C) nouns of the same semantic classes will have similar extensions to related meaning facets.

We will refer to sense and meaning facets in our following analysis.

3.2 Two approaches

According our discussion above, *quan1zi5* has both locational and metaphorical meanings. Since physical concepts and abstract concepts belong to two knowledge domains, the meaning of *quan1zi5* should be categorized into two kinds of senses in accordance with sense property (B) mentioned above. Furthermore, the two abstract meanings refer to two kinds of things (human activity area and abstract path), and can not possibly appear in the same context. This fact satisfies sense property (A). Therefore, *quan1zi5* can be differentiated into three senses.

However, if we consider example (6), it seems that locational meaning (6a, 6b) and metaphorical meaning (6c) of *quan1zi5* can occur in the same sentence (context), which satisfies the meaning facet property (A). This also implies that *quan1zi5* might have one sense that can be further divided into three meaning facets.

Now we face a dilemma because these two analysis would result in two different sense distinctions for *quan1zi5*. To resolve this dilemma, we need to make a distinction between independent ambiguous meanings and co-dependent meaning facets of a word form (Huang et al. 2003). Even though multiple meanings are available to humans in both cases, the multiple meanings can and must be resolved (i.e. disambiguated) only in the case of genuine ambiguity. Co-dependent meaning facets, on the other hand, allow the multiple meanings to exist and be interpreted by the hearer. Take (6) for instance. If we add more sentences (contexts) to (6), like ‘*tuo1 li2 wu3 dao4 jie4* (leave the dancing circle)’ as in (7),

² ‘Meaning facet’ as used here differs from ‘facet’ as used by Cruse (2000). For Cruse, facet is an expression to indicate a degree of meaning distinctness. For example, ‘book’ in (i) and (ii) is referred to ‘a physical object’ and ‘the text which the physical object embodies’ respectively. These two readings for ‘book’, which are not ordinary ambiguity, but still represent two senses, are called facets by Cruse.

- (i) Please put this book back on the shelf.
- (ii) I find this book unreadable.

(Cruse 2000, p.114)

In this paper, we use ‘facet’ to represent a meaning that extends from a particular sense Ahrens et al. (1998). This concept is similar to Cruse’s ‘sense modulation’ (2000 p.120-123).

the context forces readers to choose between the meaning of physical circle (6a, 6b) or metaphorical circle (6c). In the case of (7), *quan1zi5* only has the meaning of a social group. So this example demonstrates that ‘physical circle’ and ‘metaphorical circle’ are two independent senses for *quan1zi5*.

- (7) 因為 跳 累了，他 決定 離開 這 個 圈子，
yinwei tiao lei le ta jueding likai zhe ge quanzi
because dance tired LE he decide leave this CLASS circle
脫離 舞蹈界
tuoli wudaojie
leave dancing circle
‘He decided to leave the dancing circle because he is tired of all the dancing.’

But, even if we add extra information ‘zuo4 huei2 yi3 zi5 shang4 xiu1 xi2 (sit back to rest)’ to (6), as illustrated in (8), it is still not easy to decide whether *quan1zi5* has the meaning of the area that the circle limits (8b) or of the circle itself (8a). Therefore this instance indicates that ‘the circle itself’ and ‘the area circle confines’ are two co-dependent meaning facets for *quan1zi5*, which belong to the same sense.

- (8) 因為 跳 累了，他 決定 離開 這 個 圈子，
yinwei tiao lei le ta jueding likai zhe ge quanzi
because dance tired LE he decide leave this CLASS circle
坐 回 椅子上 休息
zuo huei yizi shang xiuxi
sit back chair rest
(8a) ‘He decided to leave from the dancing circle (formed by dancers) and sat back to rest because he is tired.’
(8b) ‘He decided to leave the dancing area circle and sat back to rest because of being tired.’

Thus, based on the discussion and sentences presented above, we conclude that *quan1zi5* has three senses. One refers to physical circle. The meanings of the circle itself and the area that the circle delimits are two meaning facets of this sense. The other two are metaphorical senses extended from the core sense and are a circle-like route formed by an activity and a normal or professional range, respectively.

Based on the above discussion, the meanings of *quan1zi5* are represented in (9), where we repeat example (1)~(5) to show the contexts that different meaning of *quan1zi5* can appear in. The meaning representation is in accordance with Ahrens et al. (1998), which is elaborated in the CKIP Technical Report 03-01 (2003).³

(9) 圈子 *QUANIZI5* くわ子 ㄉㄨㄛˋ ㄘㄩㄢˊ ㄗㄩˊ ㄗㄩˊ ㄩˊ ㄗㄩˊ ㄩˊ ㄗㄩˊ ㄩˊ ㄗㄩˊ ㄩˊ

SENSE 1: A directional circle-like line with end point coinciding with start point.

MEANING FACET 1: Physical object, i.e. the circle.

³ In the CKIP Technical Report 03-01 (2003), there are only two senses being distinguished, because sense 2 as defined in this paper was incorporated into sense 1 prior to our current analysis.

- EXAMPLE: 他們圍成一個圈子跳舞
 ‘They made a circle to dance.’
MEANING FACET 2: The area that a circle delimits.
 EXAMPLE: 你只能站在圈子內，不可以跑出來
 ‘You can only stand inside the circle. Don’t get out.’
SENSE 2: A circle-like route or trace formed by an activity.
 EXAMPLE: 我們在山上迷路了，一直在繞圈子
 ‘We got lost on the mountain and were going around in circles.’
SENSE 3: A normal or a professional range.
 EXAMPLE 1: 她的生活圈子就是台大和公館
 ‘Her usual circle of activity covers just NTU (campus) and GongGuan.’
 EXAMPLE 2: 她在美國的華人圈子很有名
 ‘She is famous in Chinese society in America.’

Moreover, the meaning extension direction of *quan1zi5* can be illustrated in figure 3, which shows that meaning facet2 of *quan1zi5* is meronymic extending from meaning facet 1, and sense 2 is metaphorical extended from meaning facet 1, and sense 3 is metaphorical extended form meaning facet 2.

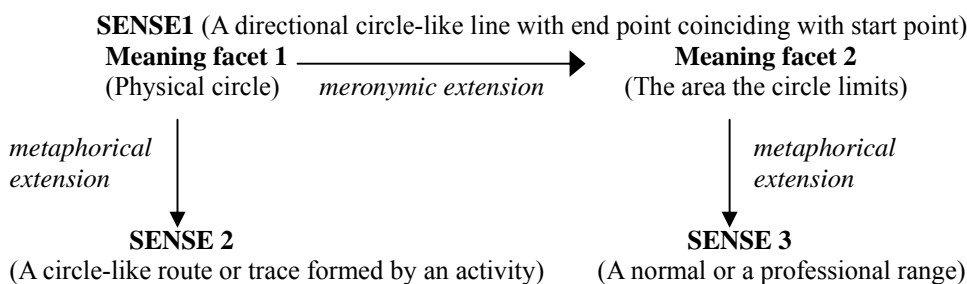


Figure 3. The meaning extension of *quan1zi5*

4. Contrast with a near synonym

In previous studies of polysemy some researchers have proposed a semantic network in which every polysemous word has a core sense that other senses are associated with and derived from (Lakoff 1987; Tyler and Evans 2001). The core meaning we assign to *quan1zi5* is ‘a directional circle-like line with end point coinciding with start point’. The reason we take this definition as a core meaning for all the senses is based on the contrast between *quan1zi5* and *huan2* ‘ring’.

Huan2 is synonymous with *quan1zi5*.⁴ While both refer to a circular circumference, *huan2* is a perfect circle that has no beginning and ending; while *quan1zi5* always implies an end point coinciding with a start point. Hence, we can draw (*hua4* ‘to draw’) a *quan1zi5*

⁴ In the definition of the Chinese Dictionary (*Revised Chinese Dictionary*, web version <http://www.sinica.edu.tw/~tdbproj/dict/>), *quan1zi5* means ‘an object or shape with a round exterior and an empty interior’, and *huan2* means ‘an object with a round shape.’

but not a *huan2*. Take (9) and (10) for instance. Example (9) is good with *hua4 quan1zi5* ('draw a circle'), but example (10) is odd with *hua4 huan2* ('draw a ring').

(9) 她 無聊地 站 在 那 ,
ta wuliaodi zhan zai na
she uninterestedly stand LOC there
不停地 用 腳 在 地上 畫 圈子
butingdi yong jiao zai dishang hua quanzi
keep with feet LOC ground draw circle
'She stood there uninterestedly, and kept drawing circles on the ground with her feet.'

(10) ??她 無聊地 站 在 那 ,
ta wuliaodi zhan zai na
she uninterestedly stand LOC there
不停地 用 腳 在 地上 畫 環
butingdi yong jiao zai dishang hua huan
keep with feet LOC ground draw ring
'She stood there uninterestedly, and kept drawing rings on the ground with her feet.'

In addition, with the "drawing" meaning, *quan1zi5* implies a center within the circle while *huan2* does not. It is this entailed centric point which allows a human reference point for the other two abstract meanings of *quan1zi5*.

5. Cognitive explanation for the lexical semantics of shapes

In this section, we will give an explanation regarding the meaning extensions of *quan1zi5*, which we will base on cognition theories. We will first discuss the meronymic extension of the two meaning facets of *quan1zi5*.

5.1 Meronymic extension of *quan1zi5*

Based on gestalt theory, a well-known vase/face illusion illustrates a phenomenon called figure/ground segregation. A figure has shape and is perceived as being more prominent than a less well-defined two-dimensional ground (Ungerer & Schmid 1996). However, it is the contour, which is the one-dimensional interface between figure and ground (Zusne 1970), which achieves prominence in front of the ground, not the figure. The reason is that for an abstract shape such as a triangle, a square, a rectangle, a circle, etc., the two-dimensional area which a contour defines is NOT different from its ground. It is only the transition of the contour that defines this figure. In other words, the most salient cognitive feature in this abstract space is the contour. Human beings can only perceive the figure area defined by the contour, and not vice versa. Figure 4 illustrates this situation.

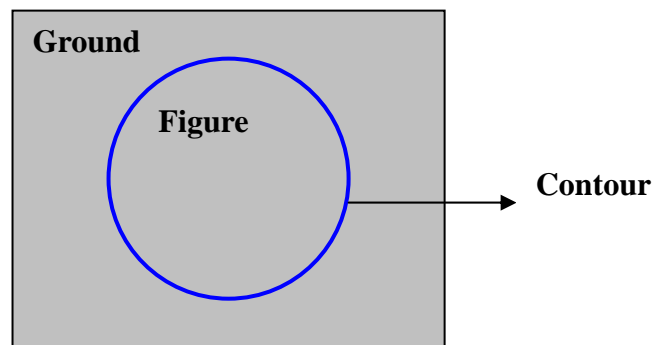


Figure 4. The contour of figure and ground

Quan1zi5 is a contour, so it is cognitively prominent for shape nouns and can be distinguished as a meaning facet.

In terms of visual perception, we know that human visual function identifies an object by identifying its shape (i.e. contour) first. This is represented in the above cognitive account of the prominence of transition. In other words, a homogenous area does NOT attract visual attention. It is the transitional feature that calls for visual attention. And when the transitional contour defines an area, we see a shape. This functional account of vision may be the fundamental motivation for language to encode the contour and the defined area as the two meaning facets of a shape.

In the following section, we will then explain the metaphorical extension of sense 2 and 3 for *quan1zi5*.

5.2 Metaphorical extension of *quan1zi5*

For a shape-process noun, such as *quan1zi5*, which includes in the meaning the process of making/drawing that contour, a human reference point is implied. This human reference point is either the drawer, or the central point from which a circle is defined (mathematically as all area within the same distance from that point). This is the basis for the metaphorical extension where the locational definition of circle and *quan1zi5*, can be extended to mean a certain set of social activities or relations centered on that reference point. Without that central reference point, no such extension is possible. Hence, we do not find the same extensions for triangle, square, rectangle, etc.

On the other hand, the meaning of PATH in sense 2 requires a start point and an end point. The shape-process noun of a circle necessarily involves these points. Hence, it is natural for its extension to take on a PATH role with verbs that require them.

6. Conclusion

In this paper, we have investigated and distinguished the meanings of *quan1zi5*. First, through analyzing sentences, we differentiated three senses and two meaning facets for *quan1zi5*. Then, we explained and established the dual meaning facets of contour and area as cognitively based, both from functional and visualization points of view. The same generalization is applicable to all shape nouns. We also show that if the additional meaning

of process (of creation of the shape) is added, further extensions involving PATH, and set members as defined by human relationships can be inferred. Although this study focused on *quan1zi5*, the cognitive explanation still is applicable to other shape nouns, and provides a good understanding of the relation between shape perception and language.

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