

LOOKING AT THE CHINESE NUMERAL THROUGH THE LENSE OF MATHEMATICAL AND LANGUAGE SIGNS EQUIVALENCE

Liudmila L. Bankova

Linguistics University of Nizhny Novgorod
Nizhny Novgorod, Russia
e-mail: lwittsa@yandex.ru

Abstract. The polystructural nature of the Chinese semiotic system manifests itself in the fact that there are several sets of numbers in China: rod numerals, banker's numerals, Arabic numerals, Roman numerals, the traditional Suzhou numerals, the Heavenly Stems and the Earthly Branches. This study has been executed in the framework of the semiotic approach and its aim is to determine which of the above sets may perform language functions, i.e. act as numerals, and to establish the bases therefor. A.F. Losev's sign theory serves as the methodological framework. The theory states that a language has a two-plane nature. In this context the relationship between the expression and the content planes are the correlation between the digit and the number. The application of the theory allows one to reveal the specificity of the language sign as opposed to the specificity of the mathematical sign.

The Frege triangle depicting the structure of the sign is used to describe such phenomena as the digit, the number, and the numeral. The left apex of the triangle represents the number (the denotatum) – id est an image in human consciousness. The upper apex of the triangle represents the sign (the character in the Chinese language). The right apex of the triangle represents the notion about the denotatum. Since the Frege triangle has only three apexes it may not be applied to all the numeric signs – just the

ones that are numerals in which case the left apex representing the denotatum remains constant and the upper and the right ones are variable.

The language sign itself is a part of the semiosis process in which the interpreter of the process is extremely important. Cultural peculiarities of the nation are encoded in the numerals – they may be understood by an interpreter who is either the native speaker or a foreigner with the appropriate cultural background.

The analysis of the nature of the Chinese numeric signs and their functions makes it possible to qualify the signs belonging to rod numerals, the Heavenly Stems and the Earthly Branches, the Suzhou numbers as numerals with the sign structure following the Frege triangle pattern.

Keywords: Chinese numerals, Chinese figures, semiotics

Introduction

There are several sets of numerals in today's China that are extensively used: rod numerals, banker's numerals, Arabic numerals, the traditional Suzhou numerals, the Heavenly Stems and the Earthly Branches, Roman numerals. This fact is the manifestation of the polystructural nature of the Chinese semiotic system which is governed both by linguistic and extra linguistic factors and reflects the Chinese cultural specificity. Studying this phenomenon in the language as a semiotic system requires the application of semiotic analysis thus contributing to the study of the worldview captured in the language.

Objectives/Purpose of the study

The **purpose** of the study is to find an answer which of the above sets may perform language functions, i.e. act as words belonging to numerals and what are the bases therefor.

Determining the array of sign-characters that are also able to represent numerals provides one with an opportunity to conduct further definitive language studies insofar as “Describing the dynamics of semantic processes and seeing a certain structure as

well as invariable rules therein turns out to be the major purpose of a linguistic analysis” (Kusse H., 2010: 298).

Methodology

This study has been executed in the framework of the semiotic approach. A.F. Losev’s sign theory serves as the methodological framework of the research. The distinguishing features of a language sign which are inherited in nonhomogeneity and versatility may be explained in the following way: “... Language specificity may only occur on the basis of a theory of a reasonably lifelike sign. The most essential thing here is that a language not only has a two-plane nature but the fact that one of the planes being the sign of the other serves to denote it. Thus a language has the elements of expression, the elements of content and the meaning that makes it possible for both the meaningful planes to exist. Keeping this view in mind, we are to enunciate the specificity of the language sign as opposed to the specificity of a mathematical sign” (Losev A.F., 1982: 10). A.F. Losev’s vision of the two-plane nature of the language is associated with the theory of the content plane and the expression plane of the language (Stepanov Ju.S., 1971: 80–101). This theory may serve as the key to understanding the multitude of the kinds of numbers that exists in China.

While describing such three aspects as a digit, a number and a numeral one may use the Frege triangle which describes the structure of a language sign (Stepanov Ju.S., 1971: 86). The left apex of the triangle represents the number (the denotatum) – id est an image in human consciousness. The upper apex of the triangle represents the sign (the character in the Chinese language). The right apex of the triangle represents the notion about the denotatum (a numeral). It is possible to suppose that each numeral represents a certain concept that is more extensive than the notion because the existence of such a large multitude of signs to denote one and the same number is inevitably associated with the fact that the notion has acquired conceptual layers (cultural peculiarities that are amongst other things are reflected in the phra-

seological stock of the language). All this is rather predictable since “The signs of hieroglyphic writing bring in an additional element of symbolic information because characters bear a graphic interpretation of the meaning contained in the notion” (Martynenko N.P., 2007: 4).

Since the Frege triangle has only three apexes it cannot be applied to all numeric signs, just the ones that are numerals, as it is shown on the figure below:

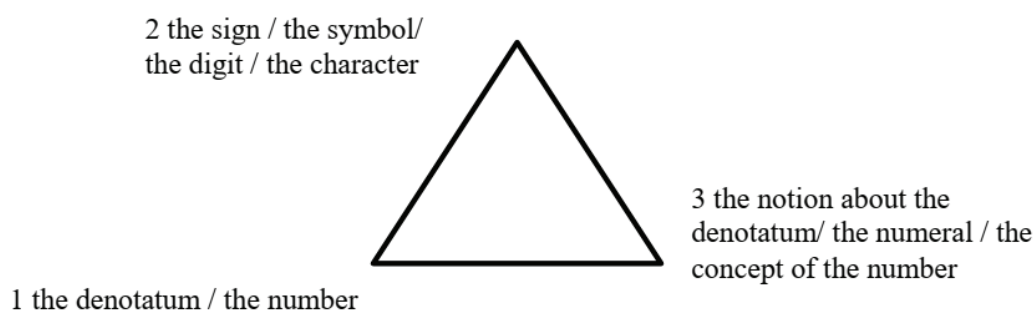


Figure 1. The schematic illustration of the Frege triangle application to the *number-digit-numeral* triad

Results

Let us apply plane of content and plane of expression theory to number “two” which may be expressed in several ways in Chinese depending on the set of numbers being used: rod numerals (二 èr and 两 liǎng); banker's numerals (貳 èr); Heavenly Stems (乙 yǐ) and Earthly Branches (丑 chǒu), the traditional Suzhou numerals (𠄎), Arabic number (2) and Roman number (II). It is worthy of noting that the pronunciation of the ancient and almost lost Suzhou numerals is currently unknown and the phonetic presentation of the Arabic and Roman numbers is identical to the rod numbers. In the above example the content plane represents number “two”, i.e. the number following number “one” and preceding number “three”. The expression plane is represented by eight signs (二, 两, 貳, 乙, 丑, 𠄎, II, 2) that are symbols. Thus the expression and the content planes are a correlation between the digit and the number.

Applying the Frege triangle theory to number “two” of the banker’s set (貳 èr) will result in the occurrence of the following figure 2:

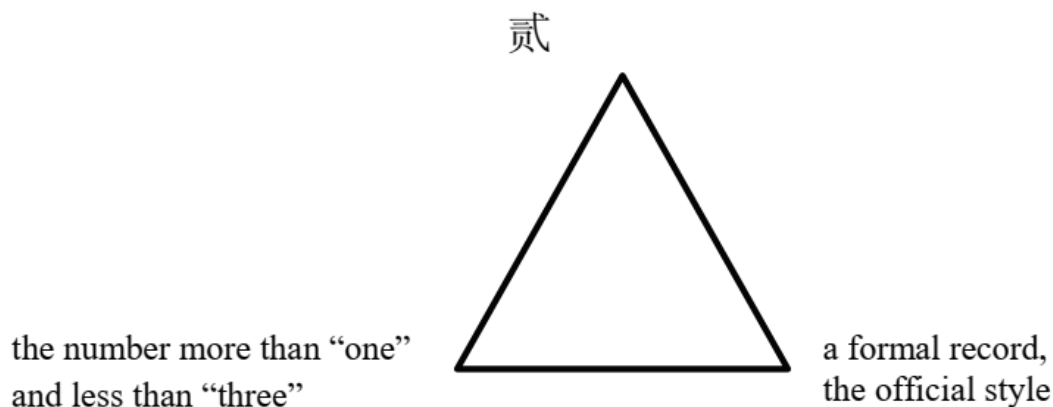


Figure 2. The schematic illustration of the Frege triangle application to the *number-digit-numeral* triad in number “two”

As to the sets of numerals in Chinese, the left apex of the Frege triangle representing the denotatum (in the case of number “two” – the number more than one and less than three) remains invariable. The upper apex is a variable: depending on the set being used the sign may change: 二, 貳, 两, 乙, 丑, 卅, II, 2. The right apex is also a variable and expresses different concepts depending on the sign that is used to express the denotatum. In other words, in Chinese when the digit symbol is changed the designatum also changes.

Thus the upper (II) apex of the Frege triangle may be expressed in different ways. The sign is included in the semiosis process or the process of sign function. C. Morris singles out three and sometimes four factors: the thing that acts as a sign; the thing that the sign points to; the action due to which the thing becomes the sign for the interpretator. These three components of the semiosis process may be called the sign vehicle, the designatum, and the interpretant, respectively. C. Morris names the interpreter as the fourth factor (Morris Ch.U., 2001: 47).

Developing the understanding of the “digit-number-numeral” triad and entering the numeral level the fourth element of the semiosis process, i.e. the interpreter of the sign joins, according to A.F. Losev, the world interpretation in invariable meanings of the lexical items or grammatical categories (Kusse H., 2010: 296). This fourth component of the semiosis process is believed to be absolutely important even in those cases where references are made to different sets of numbers in Chinese and determining the ability of their signs to be regarded as numerals. Cultural peculiarities of the nation are “encoded” in the numerals. The interpreter is able to understand them. A native speaker or a foreigner with sufficient culturological background may act as such an interpreter.

Discussion

The seven sets of numerals that exist in China are a way of writing numbers, mathematical signs. A.F. Losev draws a difference between mathematical and language signs: “... regardless of how mathematics interprets its signs, it does not have much to do with the language” (Losev A.F., 1982: 19). Mathematical signs are digits, language signs are numerals. What turns mathematical signs (digits) into language signs (numerals)? In other words, what are the criteria of referring this or that symbol-character to a numeral?

To prove an answer to this question let us specify what is understood by a Chinese numeral. The author of this study believes that it is *a class of words performing the quantitative function and denoting abstract numbers, a number of things or mental categories of order, multiplicity and totality that are connected with numbers*. Moreover, a numeral, being a nominal part of speech, performs all word functions, i.e. possesses a certain language valency: it may enter into syntactic relations with a noun and other parts of speech as well as to participate in forming the phraseological stock of the Chinese language, and may have a certain cognitive content. A numeral as a word may acquire new meanings. It is the availability of these functions that serves as

the criterion for a mathematical sign to be a language sign too – i.e. a numeral.

Let us apply the obtained criteria to the content of the Chinese sets of numbers to determine those that may function as numerals. Technically the procedure is matching them with the Frege triangle: when we observe the presence of all three apexes in a sign then it may be acknowledged as a word.

The rod numerals, certainly, match the whole *digit-number-numeral* triad, so the words behind these hieroglyphs may be acknowledged as numerals. They possess a certain connotation which may be proved by a classic example of the use of digit “four” (四 sì) representing tetrafolia. Alongside with this Chinese phraseology has a great number of quantitative phraseological units where a digit-hieroglyph functions as a word: 四平八穩 Sì píng bā wěn. Numeral 二 èr “two” has acquired a new meaning – “a narrow-minded person”.

It is yet unclear whether the banker’s numbers belong to numerals. In their essence these are the symbols replacing the rod numbers in certain highly formal situations (in banking and finances). On all accounts they cannot be considered as numerals because they do not function as words in this respect. However we have spotted phraseological units containing digit 壹 yī “one” of the banker’s set: 壹倡三叹 yī chàng sān tàn – *One (musical instrument) leads the tune, three other follow it*; 不壹而三 bù yī ér sān – *not just one thing, but both*; 不壹而足 bù yī ér zú – *be not limited by this one thing*. At the same time the latter chengyu has a variation containing the number from the rod set: 不一而足 bù yī ér zú. Is it possible in this case to consider the numbers from the banker’s set (大写 dàxiě) as numerals? It appears that their presence in the phraseological stock should be regarded as a case of statistical spread. Hence, we believe that the numbers belonging to the banker’s set are not numerals.

The set of the Suzhou numbers may definitely be regarded as numerals. The following set phrases may be given as a proof therefor: 廿四堆 niàn sì duī – *the palace servants cemetery of the South Sun dynasty*; 廿四风 niàn sì fēng – *the flowery wind*.

The Heavenly Stems and the Earthly Branches may also function as numerals (Bankova L.L., 2019).

Roman and Arabic numbers do not perform the functions of numerals as they do not match the criteria: they are not language signs and function in the “expression plane – content plane” paradigm.

From the point of view of the historic semiotic basis the Chinese language reveals a number of peculiarities that may be traced to the polystructural nature of this sign system differentiating it from other systems. Sign asymmetry, when the content plane is represented by two or more exhibitors, is observed in the Chinese language in the fact that different sets of numbers are used to record digits. Moreover, a prominent feature of the sign-hieroglyph is the fact that it combines the functions of a mathematical sign and a language sign – i.e. a word. Having analyzed the nature of the Chinese digit signs and the process of their functioning it is possible to determine the sets of numbers that may act as numerals. The following sets belong to the category of numerals: rod numerals; the Heavenly Stems and the Earthly Branches, the Suzhou numbers. As it is evident from the article above the Chinese numeral is represented by the traditional Chinese symbols only.

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