

# DEVELOPING FEATURES OF SYMBOLS USED ON CHINESE CHARTS

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## Abstract

Symbols used on charts are also called chart languages, which made up by points, lines, geometric figures and letterpress. They are believed as information transmission and communicated carriers, tools and bridge to draftsman and user through charts. Symbolism is the organic knowledge entirety to be connected with semiotics and chart cartography. The three basic features of symbols such as patterns, sizes and colors are stated firstly on this paper. And then, three main functions are introduced, including the different level abstract, summarization and simplification of Symbols to charting objects, chart maximum expression by symbols. Next, the three main developing characteristics of symbols are given, they are relatively stable, international and variability. For example, the basic patterns with some specific meaning and those of the same kind of cartographic objects are relatively stable, not having great changes. Internationalization is the result of chart using characteristics and IHO requirement. Variability is caused by symbol simplification for computer cartography and symbol internationalizing. Except the reasons of those results are analyzed in this paper, also giving explanation of some specific symbol. At last, point out the chart and map symbols not to be unified.

## Keywords

Symbol    Language    Semiology    Relative stability    Variability

## 1. The concept, characters and functions of symbols used on charts

Symbols used on charts can also be called chart language , which is made up of points, lines, geometrical graphics and notes. They are used as information transmission and communicate carriers, tools and bridges to draftsman and user through charts. Symbolism is the organic knowledge entirety to be connected with semiotics and chart cartography.

Symbols used on charts have three basic characters such as shape, size and color. Shape or pattern is the main sign discriminating from cartography objects, which reflects the type difference of the cartographic features and phenomena, possesses pictograph and knowing characters. Size mostly reflects quantity difference and the relationship of primary or secondary grade and important

or unimportant level of the cartography factors, the size of symbol and its corresponding real object directly concern with the important degree. Color not only improves the artistic expressive force of chart, but also predigests the graph differences and reduces symbol quantity. The colorful and thousands upon thousands chart symbols has been formed by the differences of shapes, sizes and colors. It is important value for us to study chart symbol and search the law.

The main functions of chart are as the following. The first, using symbolism to do multi-scale abstract, generalization and simplification to cartographic objects by chart symbols can meet the requirements of multi-scale charts. If the scale is reduced, the main characters of cartographic area is also reflected by it. The second, chart symbol gives great expressive force to chart. It can show the material features in detail, such as wrecks, aids to navigation and buildings, and also show some abstract phenomena, such as tidal current direction, magnetic declination. It can show existent objects at present, such as oil field on the seabed, artesian well platform, and also show the historical affairs, such as ancient city site in the sea, and can show the future objects, such as anchorage grounds, ports and buildings in construction. It can show the object's shapes, such as coastline shapes, also show the quality of objects, such as sandy coast, rocky coast, grovy shore and reedy shore. The third, chart symbol can improve the applied effect of the chart greatly. It can build or emerge 3D spatial models of the chart objects or phenomena in the 2D planes, such as 3D display in the chart or the computer screen by hypsometric method or hill shading method.

## **2. The developing traits of chart symbols**

With the human exploiting and using ocean resource deeply and widely, the updating of the means of surveying and mapping of ocean is faster and faster, and the requirements of quantity and variety to charts for users get bigger and bigger, many factors and phenomena in the sea area need to be presented on charts, so the special chart language--chart symbol turns into the very active factors. Some works, such as designing, updating of chart symbol, building and maintenance of symbol base, are the basic works during the course of chart production. Viewing the development of chart symbolism, it has the main characters as such following.

### **2.1 Relative stability**

*Symbols and abbreviations used on charts* is the criterion of chart symbol model and depicting rule. It formulates the standard of chart symbol and the ways of all kinds of features showed on the chart. Thereby, researching chart symbol can't leave *Symbols and Abbreviations Used on Charts*. China government established the first edition *Symbols and Abbreviations Used on Charts* in 1960, and then made five revisions in 1972,1975,1982,1990,1999. It is revised about ten years. The former revision is the base of each revision, so most chart symbols inherit in the shape, the same chart features only have the difference of size and color, but their shapes are almost same. According to contrast researching all editions of *Symbols and Abbreviations Used on Charts*, relative steady chart symbols are below.

#### **2.1.1 The basic symbols with some special meaning**

(1) Bar symbols. The basic meaning of them refers to the gradient. The slope edge lines are expressed by continuous lines, bars on one side only point to the descending directions of slope. There are part of bar symbols such as embankment, dyke, seawall, cutting, steep coast, steep coast with rock cliffs, quarry, stony mountain with cliff, cliff, rock cliff, hilltop, depression.

(2) Broken lines symbols and lines of dots, dashes symbols. Those cartographic features with low precision, low grade, instable, and underground or underwater and some cartographic phenomena of bodiless and sightless can be showed with broken line or dot line symbols, such as paths, ruined buildings, unsurveyed coastlines, approximate contour lines, approximate depth contours, intermittent rivers, seasonal lakes, road tunnels and railway tunnels are always showed with broken lines, dot lines and dash lines. Underground rivers (disappear in some place), and underwater groynes (below the chart datum ) are used to be presented by dot line symbols. Boundary symbols are also showed by dash line symbols ( broken line and dot ).The before-mentioned symbols in all kinds of editions of *Symbols and Abbreviations Used on Charts* are only the difference both the lengths of short continuous lines or diameters of dots and the spaces between the contiguous broken lines or dots, such as path symbol, the length of short continuous line is 1.2mm and the space of the contiguous broken lines is 0.8mm in 1960 edition (the book--*symbols and abbreviations used on charts*). In 1975 edition, the length is 2.5mm and the space is 1.0mm. In 1982edition, the length is 2.0mm and the space is 0.8mm. In 1990 edition, the length is 2.0mm and the space is 1.0mm. In 1999 edition, the length is 2.0mm and the space is 1.0mm.

(3) bridge symbols. Bridges are not only the road facilities that span rivers, but also the main facilities where multiple traffic lines cross in 3D. Each bridge symbol has two parallel lines and four short lines which intersect at 45 ° or 135 °. Early edition described more detail to bridge, for example, noted the bridge's structure of steel, iron, concrete and brick. But modern bridge symbol in chart has taken out that structure explanation.

#### 2.1.2 The basic patterns of the same features having no much changes

The symbols of the same features have the same basic patterns, which reflects the common traits of all the same symbols, and other symbols are based on the basic graph, then combined or derived. So all the past editions of *Symbols and Abbreviations Used on Charts* pay more attention to keep the basic graphs in similar shapes, such as intertidal areas, its basic graph is made up of the coastline of 0.2mm width and the beach line (or 0 depth contour line ) of 0.1mm width, fills with nature symbol or label, such as sand, mud, sand and mud , gravel, stone. The difference between new and old intertidal area symbol is just one or two nature symbols, such as mangrove , the difference is the variations of tree symbols in shape and size in 1960 edition and in 1999 edition. It is important to know the before-mentioned law to recognizing and using chart symbols.

## 2.2 Internationalism of chart symbol

It is the continuity of chart cartographic area---ocean water area, and the particularity of ocean navigation that decide that chart is an international map. It becomes the chief condition of making the chart internationalization that the chart symbol systems of all the countries links to the

international chart symbol system. The international chart worked out by all the countries with the uniform symbol system after *International Symbols and Abbreviations* is passed by the 13th International Hydrographic Conference in 1987. China is a number of IHO and made unremitting endeavors in the field of chart internationalization in the recent ten years. Some symbols of nautical charts for long voyage was revised in 1982 firstly, in which referred to the symbols of America, England and Japan charts. It is the first step closed to international chart symbols in China. In 1990, according to *International Symbols and Abbreviations Used on Charts* IHO issued in 1987, Chinese chart symbols are made large-scale adjustments and then *Symbols and Abbreviations Used on Charts* published. Its symbolism almost linked to the international symbolism. In order to acclimate the development of the 21<sup>st</sup> chart, in 1999, *Symbols and Abbreviations Used on Charts* was revised and published on the basis of the 1990' edition. The symbolism of the new edition has been perfected. It added the symbol of differential global positioning system (DGPS) station, and deleted Loran-A, Loran-C radio positioning systems, in which progress to be strengthened. The chart symbolism of China has been done the following efficient works to internationalization of charts.

- Adding the contrast translations of Chinese and English to the chart features.
- Water area letterpress incline to right. Chinese labels inclined to left formerly; but they turned to right after 1982, probably considered to English.

- Adding some international universal symbols, such as aids to navigation, part of maritime buoyage symbols regulated by IALA have been added and unified. In addition, some harbor installations, cultural features, and landmarks were added.

### 2.3 The variations of chart symbol

The symbol variability is mainly the changes of symbol patterns. Graph changing is affected by three factors, computer aided cartography, new chart objects and symbol internationalism. The symbol internationalism has been introduced above, here just introduce the former two kinds of variety elements. It is known to us that the simpler the graph is, the easier the operation in computer is, and the faster the speed of drawing is. Today, the applied drawing software is exploited and operated by CAD--- a common graph software. It is very difficult to depict complicated objects by the general way in CAD software. So it is necessary to compile the special drawing programs separately to draw the complicated symbols. In order to be convenient for computer cartography, the symbols of complicated design can be simplified sometimes. It is one of the reasons that made the changes of chart symbols. Lots of tall and big buildings and other objects have appeared in coastal areas with the economic development, such as the radio mast, radio tower, television tower, and the TV set antenna on the skyscraper. They have more navigational value than the seaside conspicuous trees, isolated groves, chimneys, mosques, and pagodas. So all the symbols should be showed on charts. New symbols have emerged constantly with the movement of exploiting marine resource, such as submerged oil production well, production platform, oil derrick and moorings. In short, the new symbols have been produced with the new chart features appearing. This is the second reason of causing symbols changing. It is very interesting to research chart symbols because of the changes of chart symbols.

### 3. Some problems needing perfect about chart symbols

Chart symbols can reflect all kinds of chart object scientifically and visually during the course of constantly perfect development. But, there are some problems need to be solved, such as the union of chart symbols and topographic symbols. The symbolism of charts and maps are usual different because they are compiled and published in different departments. Comparing with charts and maps published in the 1990's, you will find the difference of shapes, sizes or colors at the same cartographic objects, such as the shapes of rocks, lighthouses and light beacons, the colors of water systems and roads. All these can bring some troubles to computer cartography. Just think, how to use a lighthouse symbol whether it is like the chart symbol or it is like the map symbol in computer cartography? In addition, It is inconvenient to chart users or map users with the different symbol systems. Accordingly, it is necessary to strengthen the research of uniform of chart symbols and map symbols in the future.

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