

THE DEFINED SYSTEM OF MAP SYMBOL BASED GEOLOGICAL SUBSTANCES

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ABSTRACT:

At present the defined symbol of filling block, linear, surface based point, line and surface is a common visual method of Map Drawing Computer Software and Geographic information. In fact, the direct expression map symbol is insufficient a half of common schema, so effective producing map symbol is one of the most important problem drawn by geographical information technology platform. After analyzed medium scale map symbol, the attribute of map symbol and spatial object, relations among geometric object, the author studied the law of map symbol composite, random and directivity, summarized and proposed the defined system of map symbol based geological substances. The features of the system are corrections of symbol and the attribute of geological substances, corrections of symbol and geometric types and features of geological substances.

The points of the system are as follows.

1. symbol depending on geometric types: point, line, surface, noodle;
2. redefine of geometric object: the new geometric object constructed by geometric object is used to produce complex symbol.
3. the concept system of symbolic definition: proposing the concepts of single meta symbol, basic symbol, graphic element symbol and so on.

The paper showed all the symbol of 1:500-1:2000, 1:5000-1:10000 schema constructed by the system, and reflected that the system was effective.

1. FOREWORD

A map symbol is a main way of space information Visualization. And the map symbol is a method that can express the regional map characteristic. At present, the map Visualization of Space DLG data basically adopts the style of point, line and Region. Point mode represents Point symbol, line type represents line symbol, and filled region represents region symbol. In the DLG map, symbol is unable to keep compatibility with the map. And extensity and symbol can't get compatibility too.

For the sake of overcoming all above problem, we bring forward the Object Oriented Geographic spatial Model, as shown in Figure 1.

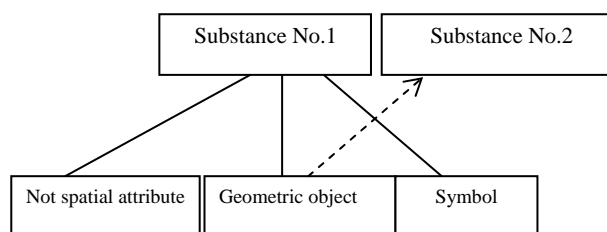


Figure 1 the Object Oriented Geographic spatial Model

On the basis of the above model, Geographical entity can be in the form of attribute, geometric object and symbol. Moreover, geometric object of different geographic objects can be identical. We can such understand, the symbol and geometric object are independent, and the entity has not only the feature of geometric object and symbol, but also its own feature and attribute, and it

can be as an independent object and derive a new object. Different objects can be not only independent but also dependent, and also can mutually inherit the feature and attribute of others. This peculiar request need that the map symbol own more powerful adaptability, but the symbol system on the basis of point, line, region-based symbol system is being a lot of defects, for example, such indicating problems of the symbol and geometric characteristic in the condition that the location of different geographical objects are the same.

At present the map symbol's characteristics are as follows: 1) the symbol on the basis of point mode, line type and filled region is unable to be qualified for expressing the complicated map symbol; 2) Symbolization of geographic information can not be subject to attribute and geometric object. 3) the robotized degree of the map symbol is not high. 4) the basic attribute of geographical factors is unable to be automatically indicated, and so on.

For all the above, we bring forward the definition system on the basis of the spatial characteristic of map.

2. MAP SYSTEM ANALYZING

2.1 Map Symbol's Orientation and Non-orientation Characteristic

As the main way that expressing the map, the map symbols should not only confirm the position of the geographical objects, but also highlight the character of the geographical entity, so which determine its orientation and non-orientation characteristic. As cliffy slope symbol, as shown in Figure 2, the generatrix shows the position of cliffy slope, and the burr show

the orientation of cliffy slope .

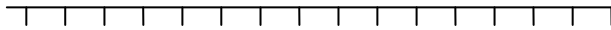


Figure 2 cliffy slope symbol

2.2 Map Symbol’s Label

The map symbol can express different geographical entity, and symbol is usually the same when the same type of geographical objects, as shown in Figure 3. Namely this symbol can show all triangle reference point; we can’t differentiate the different attribute reference point. If every triangle reference point uses different symbol, the symbol system will become very complicated, even more detrimental to identify the entities. In order to solve the problem, we usually regarded a certain attributes of the entity as a symbol and differentiate the same type entities that have different attributes. For example, triangle point is used to symbolize the reference point and the attribute of the objects is added to symbol for differentiate them, as shown in Figure 4.



Figure 3 triangle point

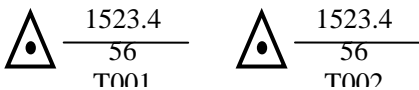


Figure 4 adding attribute to differentiate the objects

2.3 Map Symbol’s Random Characteristic

Map Symbol’s randomness indicates that the symbol expressing the map symbol’s non-orientation character have a certain randomness, for instance the symbols’ distributing、size、orientation etc. As shown in Figure 5, the symbols of a forest filled with symbols reflect a certain randomness.

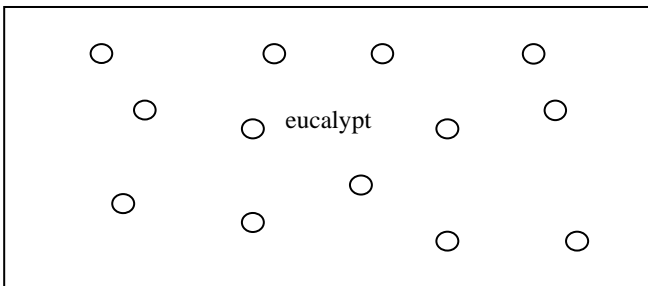


Figure 5 the symbols of a forest filled with symbols

2.4 Map Symbol’s Combination Characteristic

In order to express complex and changing geographical entity, the map symbol is a non-single map symbol. Symbol is usually a combination of symbols elements (for example: points, lines, text, images, triangle, rectangle, circle, arc etc.), a combination of different type symbols reflecting the difference between

geographical entities, as indicated Figure 2, 3,4,5.

2.5 Map Symbol’s attribute characteristic

A non-single map symbols can represent different objects by combination, but as a map, it should not only show the real world to people, but also be looked wonderful. So it’s necessary to rendering means. We usually play up the size, color, line type of the symbolic elements, and so on.

2.6 Map Symbol’s scale characteristic

With the widespread era of the computers, electronic maps enrich our vision. As we all known, the position of points、lines、regions in an electronic map is its actual location, but the symbol has scale characteristic. The position of points、lines、region in the paper map is in proportion to zoom in on the map, and the symbols has also size. This is scale characteristic of a map symbol.

2.7 Map Symbol’s multi-expression

In the same type of geographical entities, in addition to marking text, attributes is usually the same symbols to express. That is, a map symbol that is the same type of geographical entity. For example, all the scarp on the ground are not reinforced to express Figure 2.

2.8 Map Symbol’s law

Map symbol’s law refers to map symbol elements in the distribution, with the present law changes. Such as the laws of the changing line are filled with symbols, as shown in Figure 6.

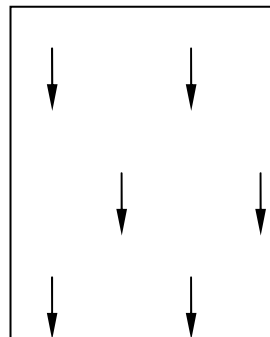


Figure 6 the laws of the changing line

2.9 Other spatial features based on the characteristics of the space

Expect for the spatial orientation characteristics, map symbols have other space features, for example, map symbols can reflect the geographical entity of length, area, orientation, geographic entities, such as spatial relationship between the characteristics of space, as shown in Figure 6

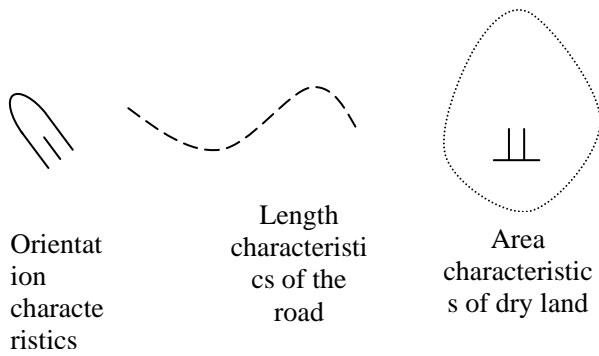


Figure 7 spatial relationship between the characteristics of space

3 Map symbol system model

3.1 The symbol administrative system

Based on object-oriented geographical entity management thinking, the entity is the combination body including attribute, geometry object, symbol object. The symbol is the entity outside manifestation, is to take entity as basis, is that the symbol is with the support of geographical feature entity, the geometry object with the entity is consult generate a map symbol.

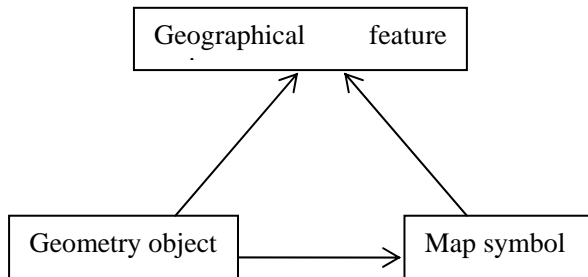


Figure 8 symbol administrative system

3.2 The symbol organization system Recommend by the same token

The map symbol is a independent element of entity, has whose oneself organization system and rule. Come to organize a map symbol for the model adapting to above-mentioned entity data organization, in the map symbol recommend the object-oriented thought by the same token, by inheritance, derived from the level of organizational structure to map symbols. The root taking entity as data organization, the basis being the symbol data organization. The symbol comes to manage according to the basic symbol, the element, a entity symbol correspondence is a basic symbol, a basic symbol can organize from many about element symbol, the symbol-maker of point, line, region can organize the basic symbol being in the state of the geometry object of the entity, generate a symbol from map cell on symbol-maker basis, as shown in Figure 9.

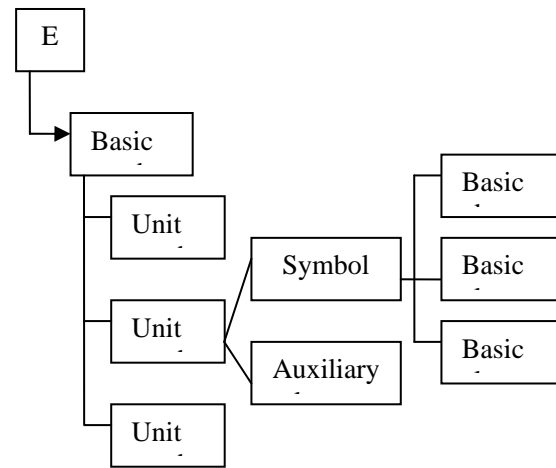


Figure 9 The symbol organization system Recommend by the same token

The basic symbol is the symbol of the basic organizational unit, it provides the type of symbol, the only code, attributes and symbols of that information remarks etc.;

The unit symbol is the symbol base unit, it is in charge of symbol organization concretely, including that fundamental symbol geometry type, additional geometry information, geometry consult location etc.;

The symbol generator is the organizer who is responsible for organizing basic element, it has stipulated the organization law and way of the unit symbol;

Auxiliary element is need to define in generating process in symbol, for instance location, numerical value, attribute, characters etc.

Basic element is to be composed of symbol, it is the parameter for stipulating the element's various type.

3.3 Basic element system

Be based on the national standard regulation to the map symbol, for adapting to the changeful map symbol, setting to basic element mainly includes the following type:

- Line segment: From starting point, coordinate and destination coordinate and the other fundamental graphic parameter generates straight line segment, Illustration 10 (a).
- Rectangle: From the rectangle, central point coordinate and long width and the other fundamental graphic parameter generates a rectangle, Illustration 10 (b).
- Triangle: Long from triangle base central point coordinate and base height and the other fundamental graphic parameter generates a triangle, Illustration 10 (c).
- Point: From central point coordinate and the other fundamental graphic parameter generates point; Illustration 10 (d)
- Circle: From central point coordinate and radius of the circle and the other fundamental graphic parameter generates a circle; Illustration 10 (e)
- Arc: From the central point coordinate, radius, start-stop angle of the arc and the other fundamental

- graphic parameter generates an arc; Illustration 10 (f)
- Ellipse: The central point coordinate , half long axes, half short axes of the ellipse and the other fundamental graphic parameter generates an ellipse; Illustration 10 (g)
- Ellipse arc: The central point coordinate , half long axes, half short axes , start-stop angle of the ellipse and the other fundamental graphic parameter generates an ellipse arc , Illustration10 (h);
- Dynamic line: From starting point coordinate and destination coordinate and the other fundamental graphic parameter generates the dynamic line, Illustration 10 (i);
- Dynamic Qie: From the starting point coordinate , destination coordinate and starting point width , destination width and the other fundamental graphic parameter generates the dynamic Qie-shaped curve , Illustration 10 (j);
- Characters: Size, character style , auxiliary definition characters , location from characters and their his fundamental artwork parameter generates characters, Illustration 10 (k).

[4] Wei Li, Yongqian Zhou. Designing and Realization of Thematic mapping symbol Library. *WuHan Surveying and Mapping Science University Journal* , 22 (3) .

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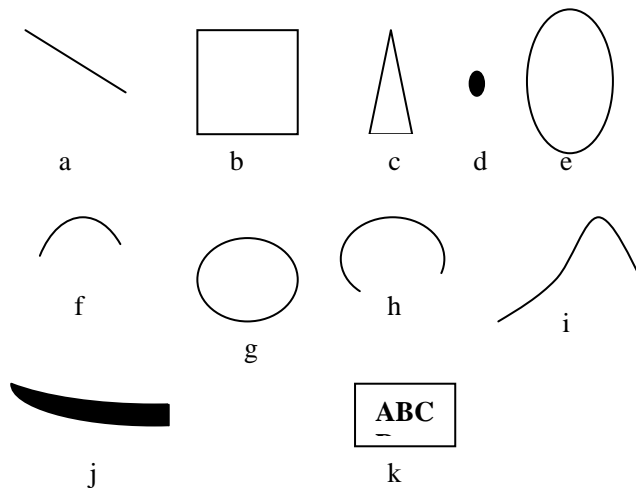


Figure 10 basic element system

4 CONCLUSION

Object-based map symbol system model is popular with the object-oriented thinking, according to the geometric properties geographical entities, non-spatial attributes, symbols separate, independent and not only constitutes a link between complex and easy to understand the object, which is mapping, built the integration of operations with unparalleled advantages.

REFERENCES

- [1] Penggen Cheng, Jianya Gong, 2000. Designing and Realization of Map Symbol Designing System of GIS . *Chinese Graphic and Image Journal*, 5(12): 1006-1012
- [2] Guorui Zhu, Lizhen Guo, Gongbai YIN, 2001, *Designing and Compilation of map*.
- [3] Shunqing Chen. Designing of Topographic Map Symbol Library. *The Architecture and Engineering*, 22(1).