

## Research for GIS Map Symbol Lib Exchange Format

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**Abstract:** Symbolic presentation is one character of GIS. Drawing symbol in GIS have been developed from early "Function Method" to current "Symbolic Library Method". By common effort of GIS community, except for symbol data, all other data such as attribute data, spatial data (even topological information) all can be exchanged from one GIS platform to another. The symbolic spatial data, when transferred from one platform to another, often lose at all. The symbol data always need to configure again, sometimes so much as all symbol library need make again. It brings inconvenient to users, and is a barrier to GIS application and popularization. This paper discuss necessity, possibility and technique path to exchange symbol library data in different GIS platforms, and then give a draft of symbolic library standard exchange format based on XML Schema. We hope this exchange format developing to a part of ISO TC211.

**Keywords:** Map Symbol Lib, Exchange Format, XML Schema

### 1 Introduce

Sharing and integrating of multi-source spatial information has been being a target of GIS. Though, this problem has some progresses, it is still far away from people's desire. Direct data access and Interoperable is a good way to this problem. But, in a long period and in many cases, people still needs to rely on data exchange to sharing and integrating data. In the forefront of GIS and CAD application, spatial data can not shared in different platform. It brought inconvenient to user and hobbled application and development of GIS industry. In common push of users, standard organization and GIS manufacture, most GIS platform have provided public exchange format for spatial data. Now, many countries have published national spatial data exchange standard. By these exchange formats, most spatial data, not only coordinator of point, line, area and annotation of feature, but also topological information can be exchanged in different GIS platforms. The progress is beneficial to GIS users, and reduces waste in social resource, and prompt GIS industry. But, in the transfer of spatial information, there is some lost in information. Among the lost, the most is symbolic presentation of spatial data. That is to say, by now, it is difficulty to transfer symbolic information of spatial data in different GIS platform. Although, it is not fatal to GIS industry, it is still a defect of GIS. For example, one user has made a lot of spatial data and many symbols with ArcInfo symbolic edit tools. Another user wants to use these spatial data and symbol in another GIS platform, such as MapGIS. Coordinates of point, line, area, annotation and topological information could be transfer, but the symbol information could not be transferred. One method of solve the problem is to make corresponding symbols with MapGIS symbolic making tools. Even though it is one of solutions, there should be better methods waiting people to discover.

Recent years, some scholars have researched into the map symbol standard problem, but mainly concentrate on map symbol appearance express, not on standard of symbol making information. SuperMap (a Chinese GIS Software Lt.), published a paper "SuperMap Vector Map Symbolic library exchange file format 2.0" in 1999<sup>[1]</sup>. By the paper, it is obviously that the author has the motive to share symbolic library in different GIS platform. It is a pity that the idea has not developed continue, and have not attracted notice of GIS community.

This paper develops the thought that existed in the paper of SuperMap<sup>[1-3]</sup>, and propose the idea that it is possible to share symbol information in different GIS platform by exchange file of symbolic library. A XML schema of symbol making information exchange format is given in the paper.

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## 2 Map Symbol and Map Symbol Library

Standard of map symbol appearance has many outstanding works<sup>[4-6]</sup>. Drawing arithmetic of map symbol there are also many mature theories<sup>[7-10]</sup>. Software implementation of map symbol drawing has developed from early “function method” to “symbol library method”. By “function method”, style and appearance of a symbol all are designed by programmer in advance. When users want to add new symbols, it is need to modify function. So, it is difficulty to become a universal method. “Symbol library method” store symbolic style information into file or database in form of library, then using a general program to draw symbol on symbolic style information from symbol library. So, by this method, it distinguishes making, modifying and displaying of symbol from symbol style information. When platform or some modules need to draw symbol, call method of symbol library module to display symbol. “Symbol library method” has become mainly trend of GIS<sup>[6-7]</sup>. Yang has clear explained theory of symbol library<sup>[10]</sup>. It is obvious that in a given symbol library system, appearance of a symbol is only relative to symbolic style information, which stored in symbol library. So, it is possible to share symbol library information in different GIS platform by symbol library exchange format. But, implementation symbol library method of different GIS software is different. Whether symbol library could be shared in different GIS Platform is still in doubt.

## 3 Theory Base of Sharing Symbol Library by Exchange Format File

It can be discovered that the procedures of making symbol by symbolic maker tools in different GIS platform are largely identical but with minor differences. Map symbol in different platform are classed into three types of point, line and area. Procedure of making a point symbol is adding some basic element, such as points, segment rectangle, ellipse and image, to the position point. Making of a line symbol is first making a unit of line symbol, then repeating drawing the symbol unit along the line. Procedure of drawing a line symbol unit is first setting a baseline, then drawing graph elements (such as point, segment, rectangle, ellipse and so on) offsetting some distance from the baseline. Procedure of area symbol is a combine of point symbol (even line symbol) on some position style.

Though implementation of symbol library and structure of symbol library exist difference in GIS platforms, the authors think that there be some data structure commonness in different symbol library. It is possible to share symbol library in different GIS platform by exchange format based XML.

## 4 XML Schema of Symbol Library Data Exchange Format

By experience of design and implementation for symbol drawing tool in GeoWindows (A GIS Platform developed by Chinese Academy of Surveying & Mapping), and experience of primary using to ArcInfo symbolic maker tool, the authors think that there are some basic law in data structure of symbol library. Reference other research work<sup>[1,10]</sup>, the authors abstract the law, and form the exchange format of symbol library.

Considering symbol library data exchange format should be easy read, easy operation, the authors design XML schema of symbol library exchange format. It uses xsd file, which is recommended by W3C. Structure of schema view is shown as figure 1, 2, 3, 4 and 5.

Figure 1 is outline of the symbol library data exchange format. Symbol Set (Symbol Library) is consisted of point symbol set, line symbol set and area symbol set. Each subset is composed of index (the order of this symbol in the sequence), id (identifier of reference this symbol in spatial data visualization), name (such as lighthouse, aerodrome, railway, freeway, forest and farmland), number of symbol and symbols. Base line type in the line symbol means that 0 is cycle base line (a line will cycle drawing section by section), 1 is global base line (a line will draw as a whole).

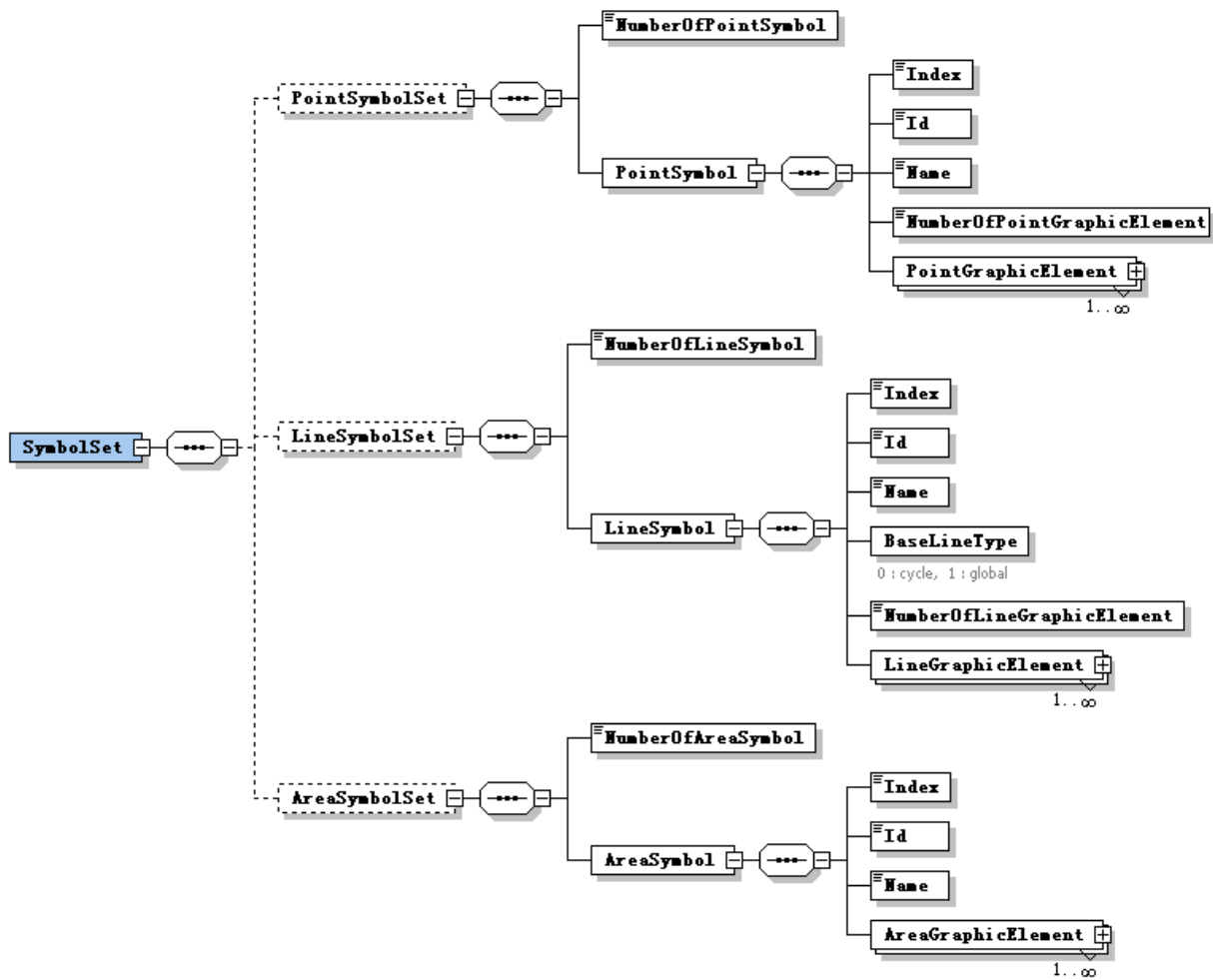


Figure1.XML Schema Structure View of Symbol Set

Figure 2 is detail of point symbol structure. It is composed of type and graphic element. The type should be one of isolated point, line string, spline curve, circle, ellipse, arch, rectangle, round rectangle and polygon.

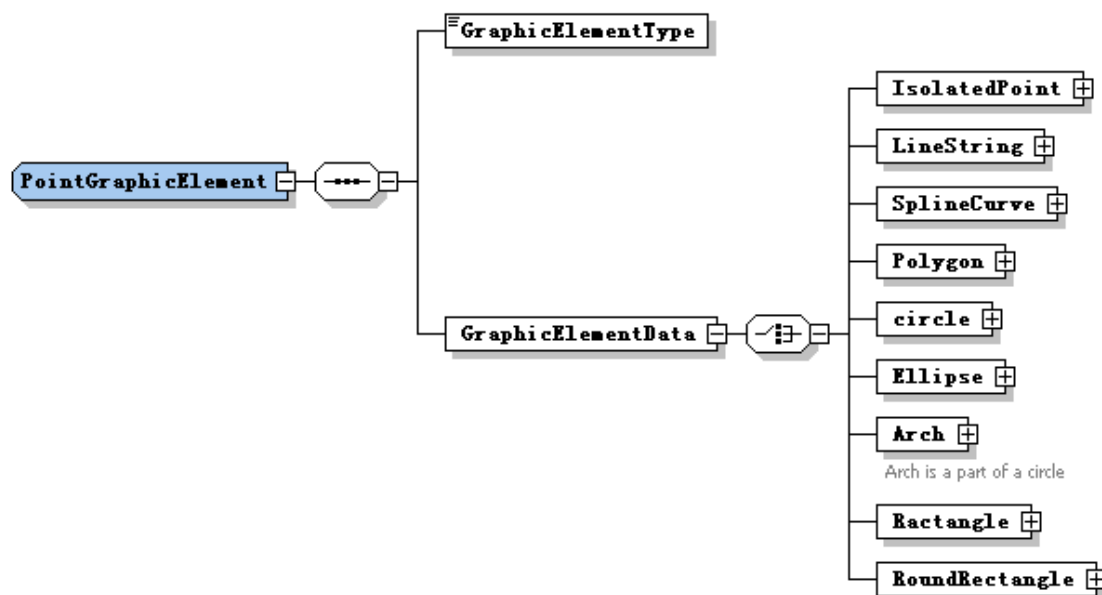


Figure 2. XML schema structure view of **point symbol**

Graphic element data of each subset are different, as shown in figure 3. Graphic element data of isolated points are consisted of number of points, coordinate of points and color. The data of line string and spline curve is consisted of number of points, coordinate of points, width and color of line. The data of polygon, circle, ellipse, arch, rectangle, round rectangle all are consisted of coordinates, width of the shape border, if it is fill, and the full color.

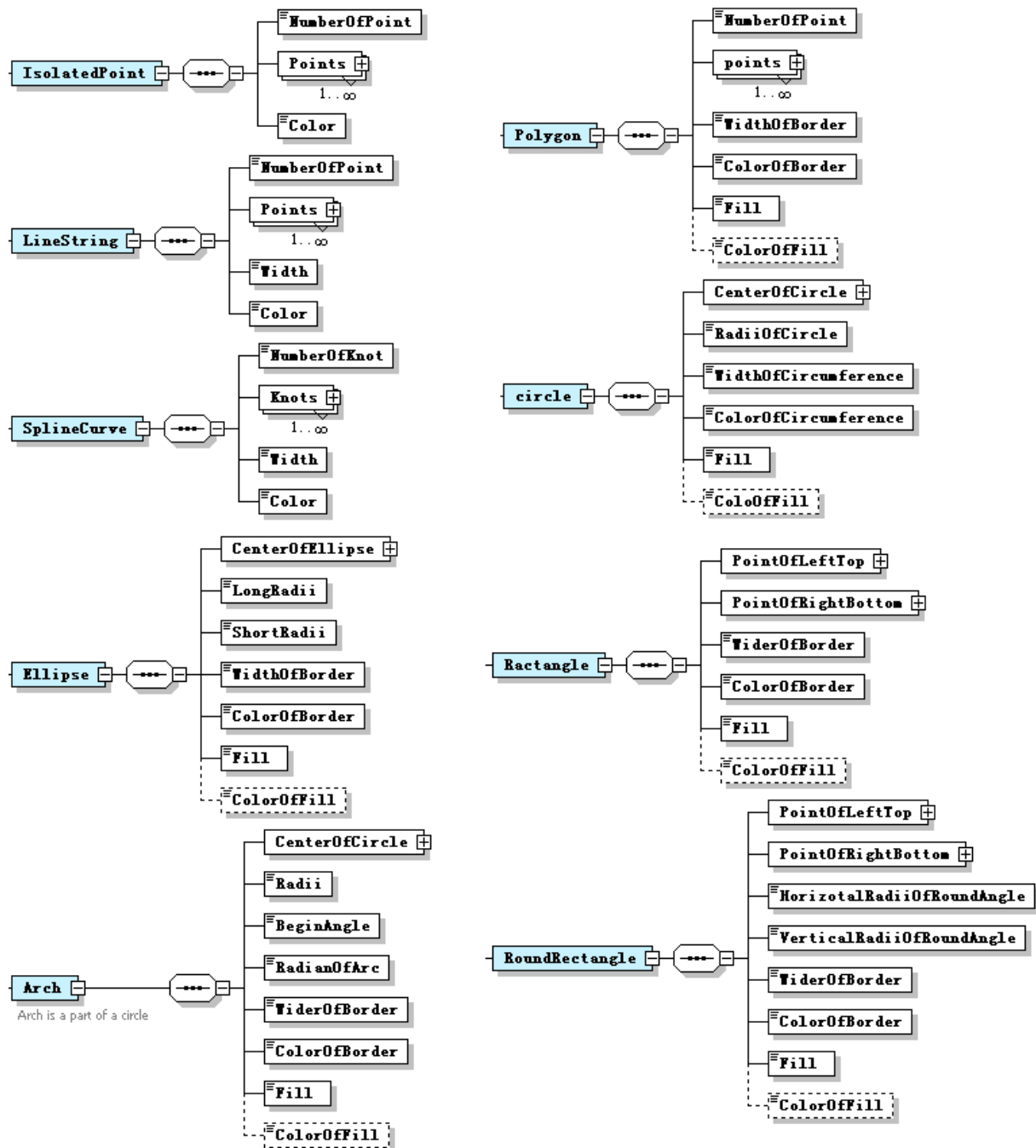


Figure 3. XML schema structure view of variety point graphics element

Data structure of line symbol is shown in Figure 4. It is consisted of number of segment and data of segment. Every segment is consisted of length of segment, width of segment, offset distance form baseline, type of segment, and point symbol (if it has). The type of segment is one of fill segment (color of fill, width of border and color of border), space segment (nothing to draw) and especial segment (if close head, width of fill and color of fill),

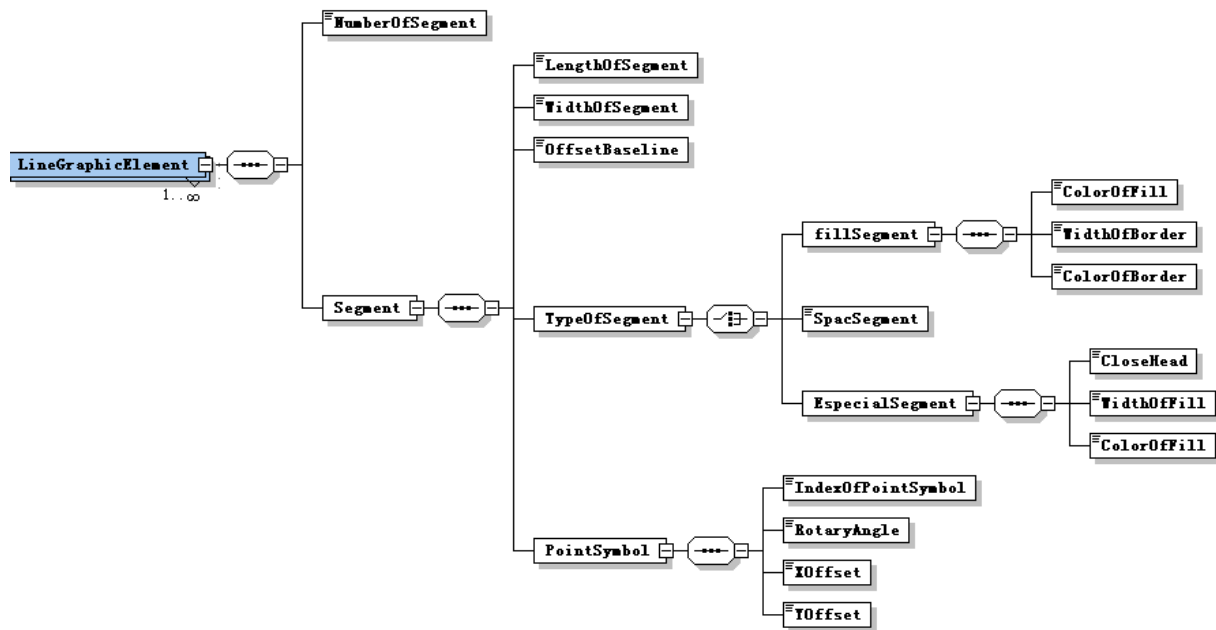


Figure 4. XML schema structure view of **line symbol**

XML schema structure view of Area symbol is show as figure 5. It is consisted of border, color of background, point-symbol of fill, line-symbol of fill. The border is one of borderless (without border), border line(type, width, color) and index of line symbol. The point symbol fill is consisted of type of point symbol(index of point symbol or name of image file), arrange mode(1:Triangle 2:Square), x space and y space. The line symbol fill is consisted of index of line symbol, rotary angle and space.

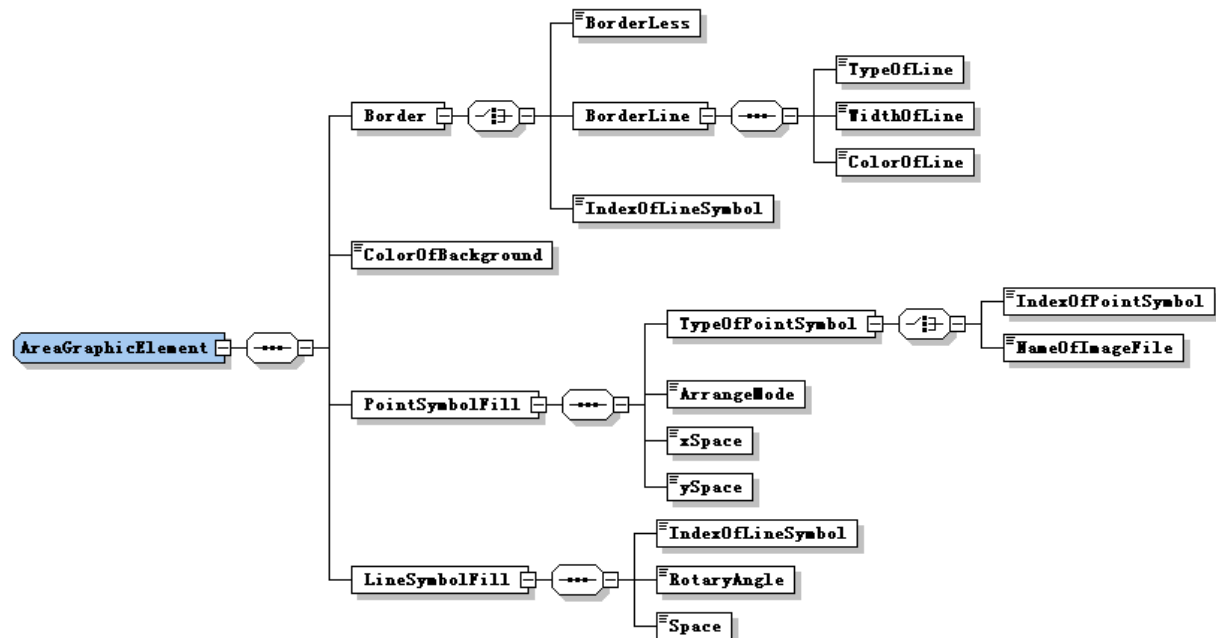


Figure 5. XML schema structure view of **area symbol**

## 5 Conclusions

To implement exchange format of symbol library, it needs cooperation of user, GIS manufacturers and standard organizations. It also needs to consider implementation method and data structure of various GIS

platforms. The exchange format XML schema introduced in this paper is only a first draft, still a lot of works needs to do, but the authors believe that it is possible to share symbol information between different GIS platforms by exchange format. It may be a rout to translate symbol library data in different GIS platform by exchange format just like exchange spatial data in different GIS platforms.

## REFEENCE

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