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Design of GML Query Language in Spatial Overlay Techniques

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Abstract— As interoperability dose not exists in different geographical databases designed by special programs and applications so data sharing is difficult to use in multiple environment. In this paper we describes the availability of interoperability to arrange the geographical database by using an approach i.e. GML (Geographical markup Language) and the paper describes the polygon overlay which is a geometric operation on two sets of polygon such as union, intersection, difference etc. GML is powerful language and can be utilize for storage, exchange and modeling of geo spatial data .

Keywords- *GML, XML, overlay technique, Super imposition, Visualization.*

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I. INTRODUCTION

Interoperability is the ability of a system, or components of a system, to provide information portability on different hardware platform (Bordie, 1992). Two kinds of interoperability can be distinguished. For a program, data interoperability means the ability to utilize a range of data formats. For a data set, program interoperability means that it can be used by different types of programs (Laurini, 1998). An interoperable database refers to the data level interoperability. It can be used by different types of programs and applications. With interoperable databases users can request and integrate data easily no matter whether the databases are stored locally or remotely. The interoperability of data from heterogeneous sources is extremely important in the context of geographical applications.

A geospatial application is supported by a database or file system that can handle spatial data types. Spatial data objects not only have a non-spatial description, such as name and population, but also have spatial attributes, such as location, geometry and neighborhood properties. A geospatial application must provide various functionalities, including input, storage, retrieval, selection, analysis, and display of the information. Although these features are also provided by traditional applications, they rarely hold spatial information in a uniform format, which may lead to problems in the exchange of spatial information. GML is designed for use as a common language that applications can use to communicate with each other and exchange information with minimal overhead. GML representation of information is unique, the way its information is used can differ, and its meaning can vary according to context.

II. OBJECTIVES

- The main objective of paper is to present polygon overlay which is a geometric operation on two sets of polygon such as union, intersection etc.
- The another objective of the paper is to manipulate the layer which can be superimposed in case of vector data and in case of raster data format the operation is known as grid overlay.
- The final objective of the paper is a spatial join. It is based on the table join operation in which layers can be appended.

III. METHODOLOGY

When two or more graphic symbols or thematic features are operated on union function then the output layer after the union operation contains all of symbols or thematic features without repeating any part of symbol or thematic feature from the Input symbols or thematic features.

Let A be the first graphic or thematic feature and B be the second one

Then

$$A \cup B = \{x : x \in A \; or \; x \in B\}$$

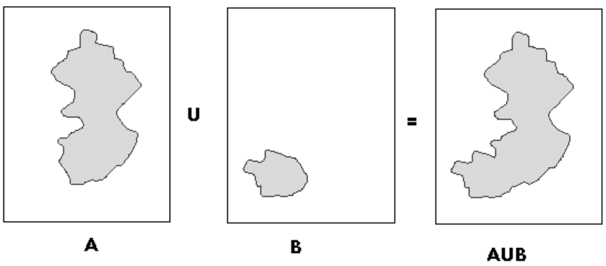

Figure 1 Union operation on a given map

A. Union Algorithm

Input : Two graphic or thematic features

Output : Output will be a single graphic or thematic feature which is union of the input graphics

Process:

Step 1 Cut out all of the intersection points on both of the graphic symbol or thematic feature to create four parts i.e. A_1, A_2, B_1, B_2 as shown in fig. 2. here parts of A are known as A_1 and $A_2$and parts of B are known as B_1 and B_2

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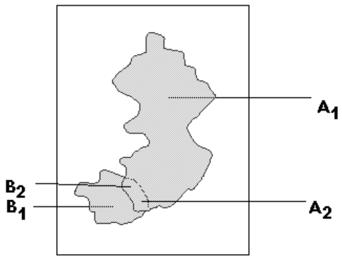


Figure 2 Parts of features

Step 2 remove part A_2

Step 3 create a new polygon by merging the parts A_1, B_2 and B_1.

B Intersection

When two or more graphic symbols or thematic features are operated on Intersection function then the output layer after the Intersection operation contains any part of symbol or thematic feature from the Input symbols or thematic features which is common in each one.

Let A be the first graphic or thematic feature and B be the second one.

Then

$$A \cap B = \{x : x \in A, \, and \; x \in B\}$$

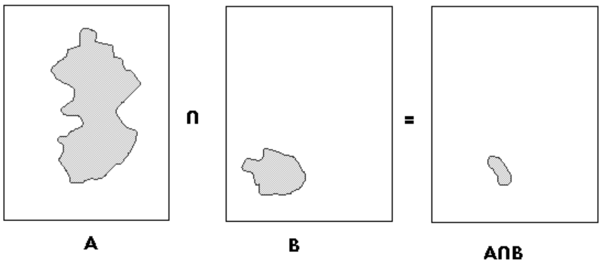


Figure3 The Intersection properties of two features

Intersection Algorithm

Input: Two graphic or thematic features

Output: Output will be a single graphic or thematic feature which is intersection of the input graphics

Process :

Step 1 Cut out all of the intersection points on both of the graphic symbol or thematic feature to create four parts i.e. A_1, A_2, B_1, B_2as shown in fig. 3. Here parts of A are known as A_1 and $A_2$and parts of B are known as B_1 and B_2

Step 2 remove part A1,A_2,and B_1

Step 3 remaining part B_2 will be the output

C Difference

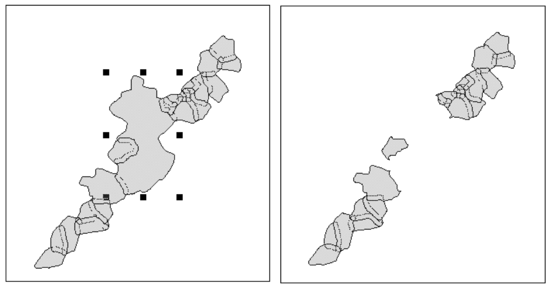
1) Absolute Difference

When a group of graphic symbols or thematic features are operated on Absolute Difference function then the output layer after the Absolute Difference operation contains remaining symbols or thematic feature from the view which is not in the given group of features.

Let A be the group of graphic or thematic feature and U be the group of all graphic symbol or thematic features

Then

$$A' = \{x : x \in U, x \notin A\}$$



(a) Selected feature (b) A'=U-A

Figure 4 Absolute Difference

2) Relative Difference

When two graphic symbols or thematic features are operated on Relative Difference function then the output layer after the Relative Difference operation contains the part of symbol or thematic feature from the firstly selected one which is not overlapped by second one. In this result the second one and its overlapping part of first one are removed and only remaining part of first one will come to result.

Let A be the first graphic or thematic feature and B be the second one

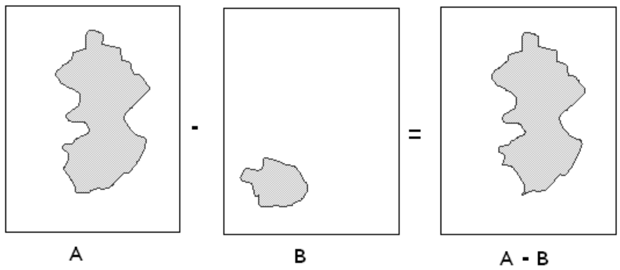


Figure 5 Subtraction of two features (A-B)

Then

$$A / B = A - B = \{x : x \in A, x \notin B\}$$

$$B / A = B - A = \{x : x \in B, x \notin A\}$$

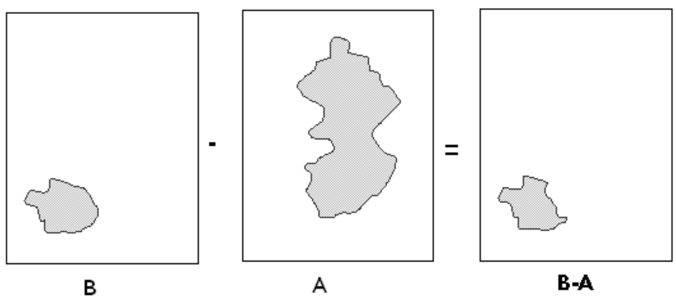


Figure 6 Subtraction of two features (B-A)

Difference Algorithm

Input : Two graphic or thematic features first one is A and second one is B

Output : Output will be a single graphic or thematic feature which is difference of B from A.

Process :

Step 1 Cut out all of the intersection points on both of the graphic symbol or thematic feature to create four parts i.e. A_1, A_2, B_1, B_2 as shown in fig. 7. Here parts of A are known as A_1 and $A_2$and parts of B are known as B_1 and B_2

Step 2 remove part A_2, B_1 and B_2

Step 3 remaining part B_1 will be the output

3) Symmetric Difference

Algorithm

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Input: Two graphic or thematic features first one is A and second one is B
Output: Output will be a single graphic or thematic feature which is symmetric difference of A and B.
Process :
Step 1 Cut out all of the intersection points on both of the graphic symbol or thematic feature to create four parts i.e. A_1, A_2, B_1, B_2 as shown in fig. 7. Here parts of A are known as A_1 and $A_2$and parts of B are known as B_1 and B_2
Step 2 remove part $A_2$and B_2
Step 3 merge the remaining part A1 and B_1 which will be the output

IV. Applications (Use of GML in GIS)

The GIS data formats are needed in expensive GIS formats to display & manipulate geodata. The alternative way is GML. As geodata format to solve the problem in GML spatial data and attributes becomes open an accessible to any user.
Since GML is an XML based technology, XML takes data in GML format and use them to generate the SVG (Scalable Vector Graphic) format.
GML is text based technique therefore it can be easily understood. GML is interoperable therefore old data can be read out.

V. Conclusion

GML is powerful language and can be utilize for storage, exchange and modeling of geo spatial data. It is portable & provide support for temporal data. GML can encode any type of geographic information and can be sent to any device with XML interface. The design of GML query language uses both spatial and non-spatial data. Queries can be improved with the help of indexing technique such as "Quad tree" and "R-tree".
GML has the ability to represents geo-spatial phenomena such as 2D linear feature, 2D topology and the relationship between features and geometric curves. Integration of GML technology with mobile devices is the new area. Because it reduces storage requirement & maximize the uses of memory. WFS, WCS & WMS are the standard approaches for geo-spatial data manipulation. For this reason we have describes overlay technique and layer super imposition of GML application which are concerned in this paper.
Visualization of GML documents can be seen by SVG technology.

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