SuperMap Objects Java 6R Technical Document

——Overlay Analyst

SuperMap Software Co., Ltd.

Beijing · China

Legal Statement

1. The copyright of this document is covered by SuperMap Software Co., Ltd. in accordance with the Copyright Law of the People's Republic of China and the Universal Copyright Convention. If, without the written permission of the company, any part of the document shall not in any way or any reason be used, copied, modified, transmitted, or bundled with other products to be used, sold, tort reserved.

2. "超图", "SuperMap", and are the registered trademarks of SuperMap Software Co., Ltd., protected by the Copyright Law of the People's Republic of China. If, without the written permission of the company, the trademarks shall not in any way or any reason be used, copied, modified, transmitted, or bundled with other products to be used, sold, tort reserved.

3. This document represents no responsibilities of any supplier or agent. Without statement, SuperMap Software Co. Ltd. has right to do modifications to this document.

4. The copyright of trademarks mentioned in this document belongs to the corresponding companies. Without the written permission of these companies, the trademarks shall not in any way or any reason be used, copied, modified, or transmitted.

5. The concerned software products and the updated products hereinafter in this document are developed and sold by SuperMap Software Co., Ltd.

Hereby declare

SuperMap Software Co.. Ltd.:

Add: 7/F Tower B, Technology Fortune Center, No. 8 Xueqing Road,

Haidian District, Beijing, 100192, P. R. China

Tel: +86-10-82736655-4170

Fax: +86-10-82734630

HomePage: www.supermap.com

Sales: request@supermap.com

Tech Support: globalsupport@supermap.com

SuperMap Software welcomes all advices and suggestions from you.

Content

1 The Definition of Overlay Analysis 1

2 The Goal of Overlay Analysis 2

3 The Principle of Overlay Analysis 3

4 The Mode of Overlay analysis 7

4.1 Clip 7

4.2 Union 10

4.3 Erase 13

4.4 Intersect 16

4.5 Identity 20

4.6 XOR 23

4.7 Update 26

5 Appendix 29

1

The Definition of Overlay Analysis

Overlay analysis is a very useful spatial analysis function, which produces a new dataset by a series of geometry operations of two datasets.

Three datasets will be involved in vector overlay analysis. The first dataset is the Input Dataset (named First Dataset in SuperMap GIS) with type of point, line or region and so on. The second one is the Overlay Dataset (named Second Dataset). The last one is the Overlay Result Dataset, which contains the geometry information and property information of the dataset after set operations.

2

The Goal of Overlay Analysis

Overlay analysis processes and analyzes the spatial data and provides new spatial geometry information to users. Meanwhile, overlay analysis is able to process various attributes of the data.

It is widely used in Resource Management, Urban Construction Assessment, Land Management, Agriculture Forest and Husbandry industries, Statistics and other fields.

The following are the introductions of using overlay analysis in the stated fields:

1) Resource Management

   It is applied in agriculture and forest industries, and help to manage the distribution variation and statistics of all kinds of resources, such as land, forest and pasture.

2) Urban Construction Assessment

   Help to analyze changes of urban population, economy, constructions, and collect statistics on the variations trend and regulations.

3) Land Information System and Cadastral Applications

   The management of land and cadastral deals with land use properties, land contours, and the land ownership and other contents. With the help of overlay analysis in GIS, the users can do the job in high efficiency and quality.

4) Management and Evaluation of Ecology and Environments

   Overlay analysis is used to evaluate the regional ecological plans, present environment situation, and the influence of environment and provides support to decisions on declining pollutant distribution and so on.

5) Geosciences Research and Application

   It is used in terrain analysis, watershed analysis, land use analysis, economic geological research, spatial statistic analysis, mapping and so on.

3

The Principle of Overlay Analysis

Spatial overlay analysis involves logic intersection, logic union, logic difference, logic exclusive-or operation. The following are introductions of properties and laws of layer Boolean logic operations.

For a convenient discussion, we define the layers A, B, C as binary images in Euclid Space.

Definition 1: IF $x \in A$, AND $x \in B$, THEN A is the sub-image of B, or B contains A, denoted by:

$$A \subseteq B$$

Properties:

$$A \subseteq A$$

$$A \subseteq B,\ B \subseteq C \Rightarrow A \subseteq C$$

$$A \subseteq B,\ B \subseteq A \Rightarrow A = B$$

IF $A \subseteq B,\ A \neq B,$ THEN A is the proper sub-image, denoted by: $A \subset B$

Definition 2: A INTERSECTION B is denoted by: $A \cap B = \{x | x \in A \text{ and } x \in B\}$

Properties:

$A \cap A = A$

$A \cap \phi = \phi$

$(A \cap B) \cap C = A \cap (B \cap C)$

IF $A \cap B = \phi$, THEN A has no overlap with B.

Definition 3: A UNION B, denoted by: $A \cup B = \{x | x \in A \text{ or } x \in B\}$

Properties:

$A \cup A = A$

$A \cup \phi = A$

$(A \cup B) \cup C = A \cup (B \cup C)$

Definition 4: A DIFFERENCE B, denoted by: $A-B = \{x | x \in A \text{ and } x \notin B\}$

Properties:

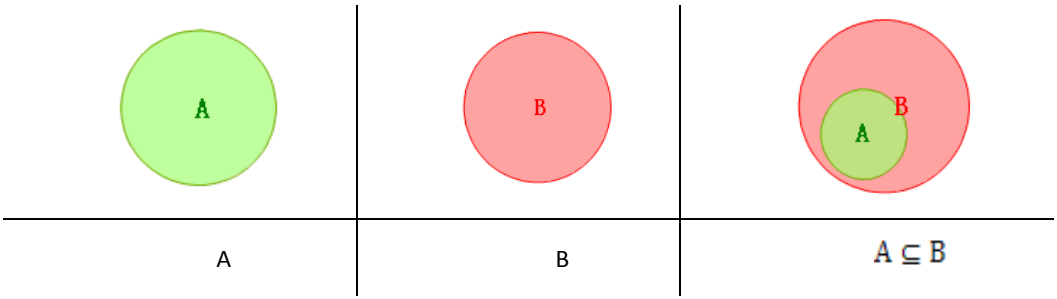
$A-\phi = A$

$A-A = \phi$

$(A-B)-C = A-(B \cup C)$

Definition 5: A EXCLUSIVE-OR B, denoted by: $A \oplus B = \{x | x \in A \text{ or } x \in B, \text{ and } x \notin A \cap B\}$

The following diagram displays the Boolean logic operations of logic intersection, logic union, logic difference, and logic exclusive-or.



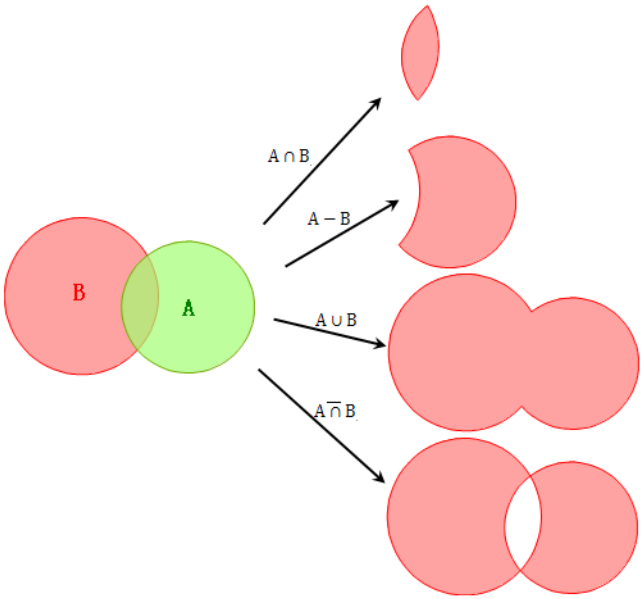


Diagram 1 Boolean calculation

4

The Mode of Overlay analysis

SuperMap GIS provides seven operators, including clip, erase, union, intersect, indentify, XOR, and update. You may conduct overlay analysis on the dataset and record set. We have reloaded every operator.

4.1 Clip

Clip means retrieving part of the feature sets from the clipped dataset (the First Data Set). The clipped dataset can be a point, line, region, route, or CAD dataset, while the clipping dataset (the Second Data Set) must be a region dataset. As a result, only the desired features in the clipped dataset contained by the region of the clipping layer will be output to the result dataset.

Method to clip a vector dataset by another dataset:

Syntax:

boolean clip (DatasetVector dataset,DatasetVector clipDataset,DatasetVector resultDataset,OverlayAnalystParameter parameter);

Illustration:

The features that contained in the clipped dataset (the First Dataset) and not in the clipping dataset (the Second Dataset) will be clipped and deleted.

Parameters:

dataset: the clipped dataset, or the First Dataset. The type of point, line and region are allowed.

clipDataset: a dataset used to give the clip region, or the Second Dataset. As a result, it has to be a region dataset.

resultDataset: a dataset that saves the result of the vector data clip.

parameter: parameter objects of the overlay analysis, used to configure the reserved fields and other parameters in the analysis.

Return Value:

Returns True when clip is achieved, otherwise returns False.

Clip the vector dataset by a geometry object array:

Syntax:

boolean clip (DatasetVector dataset,Geometry[] clipGeometries,DatasetVector resultDataset,OverlayAnalystParameter parameter);

Illustration:

The features that are outside of the region of the geometry object array will be clipped and deleted.

Parameters:

dataset: the clipped dataset, which can be the point, line or region type.

clipGeometrys: geometry object dataset that is used to provide a clip region, which must be a region geometry object.

resultDataset: a dataset that saves the clip result.

parameter: parameter objects of overlay analysis. These parameters configure the reserved fields and other relative parameters during the analysis.

Return Value:

Returns True when clip is achieved, otherwise it returns False.

Method to clip recordsets

Syntax:

Boolean OverlayAnaylst.Clip (Recordset recordset, Recordset clipRecordset, DatasetVector resultDataset,OverlayAnalystParameter parameter);

Illustration:

Clip the recordset, the objects in the first dataset and not in the second dataset will be clipped and deleted.

Parameters:

recordset: the clipped recordset, also named the First Record Set. It can be the point, line, or region type.

clipRecordset: the clipping recordset, also named the Second Record Set, which has to be the region type.

resultDataset: vector dataset used to save the clip result.

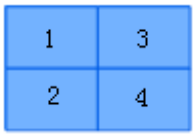
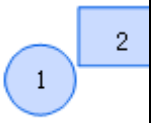
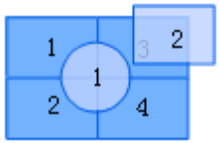
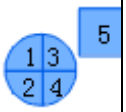
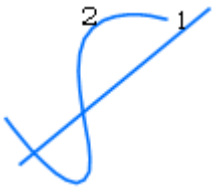
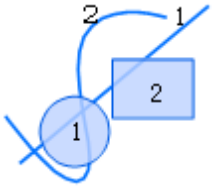
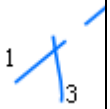
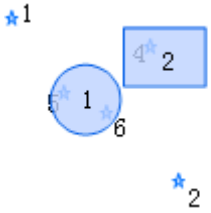
parameter: parameter objects of the overlay analysis. They configure the reserved fields in the analysis as well as other parameters.

Return Value:

Returns True when clip is achieved, otherwise returns False.

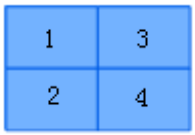
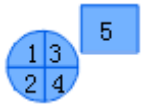
For example: Clipping the National land use map by using the administrative boundary map of Beijing, you will get the land use map of Beijing.

Diagram 2 Clip

The First Dataset (the clipped dataset)	The Secondary Dataset (the clipping dataset)	Overlay display	resultData set
			
			
			

The attribute table of output dataset of the clip operation consists of attributes in the clipped dataset. And the result dataset has the same attribute table structure with the clipped dataset. Most of the attribute values will be kept, except the area, circumference, length and other attributes, which have to be recalculated. The configuration of attribute table is shown as the following table. All the fields in dataset A have been added.

Table 1 *Clip*

The First Dataset (A)	The Second Dataset (B)	Output
		
SmID | SmUserID | W 1 | 1 | A 2 | 2 | B 3 | 3 | C 4 | 4 | D	SmID | SmUserID | W 1 | 5 | E 2 | 6 | F	SmID | SmUserID | W 1 | 1 | A 2 | 2 | B 3 | 3 | C 4 | 4 | D 5 | 3 | C

4.2 Union

Union operation produces a result of all the features of two layers, and it is only for two layers. The result layer keeps all the features in the two layers. The overlap part of the two layers becomes a separated polygon, and all the geometry and attribute information will be inherited in the result layer.

For instance: Union two layers, a Chinese plant category layer and a Chinese soil type layer, the result map will contain all the features of plant categories and soil types. We are able to locate areas that have red soil and the coniferous forest.

Methods of conducting union datasets:

Syntax:

boolean union (DatasetVector dataset, DatasetVector unionDataset, DatasetVector resultDataset,OverlayAnalystParameter parameter);

Parameters:

dataset: the united dataset, also named the First Dataset, which must be the region type.

unionDataset: the uniting dataset, also named the Second Dataset, which must be the region type.

resultDataset: this dataset saves the vector dataset of union result.

parameter: parameter objects of the overlay analysis, configuration of reserved fields in the analysis as well as other parameters.

Return Value:

Returns True when union is achieved, otherwise it returns False.

Methods of conducting union operations to the region dataset by a region object array:

Syntax:

boolean union(DatasetVector dataset,Geometry[] unionGeometries, DatasetVector resultDataset,OverlayAnalystParameter parameter)

Illustration:

Conducting union analysis to a region datasets by using a region object array will produce a dataset carrying all the objects of the dataset and array. The overlap part will be intersected and separated displayed.

Parameters:

dataset: the united dataset, also named the First Dataset, which must be the region type.

unionGeometries: a region object data array used to unite in the overlay analysis.

resultDataset: a vector dataset contains the union result.

parameter: parameter objects of the overlay analysis, configuration of reserved fields in the analysis as well as other parameters.

Return Value:

Returns True when union is achieved, otherwise it returns False.

Methods of union record sets:

Syntax:

boolean union (Recordset recordset,Recordset unionRecordset,
DatasetVector resultDataset,OverlayAnalystParameter parameter)；

Illustration:

union two recordsets means the objects in the First Recordset and not in the Second Recordset will be united and deleted.

Parameters:

recordset: the united record set, also named the First Record Set, which must be the region type.

unionRecordset: the uniting record set, also named the Second Record Set, which must also be the region type.

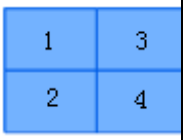
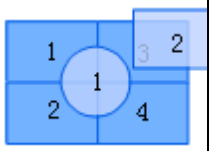
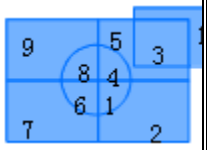
resultDataset: a vector dataset keeps the union result.

parameter: parameter objects of the overlay analysis, configuration of reserved fields in the analysis as well as other parameters.

Return Value:

Returns True when union is achieved, otherwise it returns False.

Diagram 3 Union

The First Dataset	The Second Dataset	Overlay Illustration	resultDataset
			

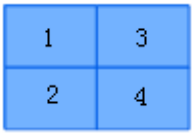
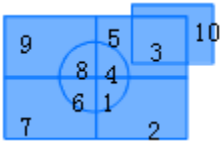
The property table of the union operation output consists of property tables of the two input dataset. Users are able to select the necessary property fields that should be kept according to their requirements. We provide a class named OverlayAnalystParameter that configures the fields. The following is the illustration of this class.

Table 2 The Methods List of Class OverlayAnalystParameter

Methods	Descriptions
getOperationRetainedFields() or setOperationRetainedFields(String[] value)	Sets or returns the field name set that includes the required elements of the Second Dataset in the overlay analysis.
getSourceRetainedFields() or getSourceRetainedFields(String[] value)	Sets or returns the field name set that includes the required elements of the First Dataset in the overlay analysis.
getTolerance() or setTolerance(double value)	Sets or returns the tolerance value of the overlay analysis

The table below shows the configuration of properties. If the attribute names of dataset A and dataset B are different, all the fields will be added to the property table of the result dataset. For instance, attribute fields P and Q will be added into the property table of the result dataset. If they have the same attribute names, the system will give an alias to one of them, and then add them into the property table of the result dataset. For instance, attribute field W. Users are allowed to keep the selected property fields.

Table 3 Union

<table>
<tr><th>The First Dataset (A)</th><th>The Second Dataset(B)</th><th>Output</th></tr>
<tr>
<td> 
</td>
<td>
</td>
<td> 
</td>
</tr>
<tr>
<td>
<table>
<tr><th>SmID</th><th>W</th><th>P</th></tr>
<tr><td>1</td><td>A</td><td>11</td></tr>
<tr><td>2</td><td>B</td><td>12</td></tr>
<tr><td>3</td><td>C</td><td>13</td></tr>
<tr><td>4</td><td>D</td><td>14</td></tr>
</table>
</td>
<td>
<table>
<tr><th>SmID</th><th>W</th><th>Q</th></tr>
<tr><td>1</td><td>E</td><td>21</td></tr>
<tr><td>2</td><td>F</td><td>22</td></tr>
</table>
</td>
<td>
<table>
<tr><th>SmID</th><th>P</th><th>Q</th><th>W</th><th>W_1</th></tr>
<tr><td>1</td><td>14</td><td>21</td><td>D</td><td>E</td></tr>
<tr><td>2</td><td>14</td><td></td><td>D</td><td></td></tr>
<tr><td>3</td><td>13</td><td>22</td><td>C</td><td>F</td></tr>
<tr><td>4</td><td>13</td><td>21</td><td>C</td><td>E</td></tr>
<tr><td>5</td><td>13</td><td></td><td>C</td><td></td></tr>
<tr><td>6</td><td>12</td><td>21</td><td>B</td><td>E</td></tr>
<tr><td>7</td><td>12</td><td></td><td>B</td><td></td></tr>
<tr><td>8</td><td>11</td><td>21</td><td>A</td><td>E</td></tr>
<tr><td>9</td><td>11</td><td></td><td>A</td><td></td></tr>
<tr><td>10</td><td></td><td>22</td><td></td><td>F</td></tr>
</table>
</td>
</tr>
</table>

4.3 Erase

Erase operation produces a layer holds the elements that are exclusive of the overlap polygons in two layers. The erasing dataset should be the region type, while the erased dataset can be a point, line, or region dataset. The polygon region set in the erasing dataset defines the region that is going to be erased. The features that are located outside of the polygon region will be kept and output to the result dataset while those in the region will be deleted. This is opposite to the process of union operation.

Methods of erasing a dataset by another datasets:

Syntax:

boolean erase(DatasetVector dataset,DatasetVector eraseDataset,
DatasetVector resultDataset,OverlayAnalystParameter parameter);

Parameters:

dataset: the erased dataset also named the First Dataset, which could be the point, line, or region type.

eraseDataset: the erasing dataset, also named the Second Dataset, which must be the region type.

resultDataset: contains the vector dataset of erase result.

parameter: parameter objects of the overlay analysis, configuration of reserved fields in the analysis as well as other parameters.

Return Value:

Returns True when erase is achieved, otherwise it returns False.

Methods of erasing a dataset by a geometric object array:

Syntax:

boolean erase(DatasetVector dataset,Geometry[] eraseGeometries, DatasetVector resultDataset,OverlayAnalystParameter parameter)

Parameters:

dataset: the erased dataset which could be the point, line, or region type.

eraseGeometries: geometry object dataset that is used to limit the output region, which must be a region geometry object.

resultDataset: the dataset that the erase result saved.

parameter: parameters objects of the overlay analysis. These parameters configure the reserved fields and other relative parameters during the analysis.

Return Value:

Returns True when erase is achieved, otherwise it returns False.

Ways to erase recordsets:

Syntax:

Boolean OverlayAnaylst.Erase (Recordset recordset,Recordset eraseRecordset, DatasetVector resultDataset,OverlayAnalystParameter parameter)；

Parameters:

recordset: the erased record set, also named the First Record Set. It could be the point, line, or region type.

eraseRecordset: the erasing record set, also named the Second Record Set, which has to be the region type.

resultDataset: vector dataset used to save the erase result.

parameter: parameter objects of the overlay analysis. They configure the reserved fields in the analysis as well as other parameters.

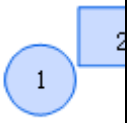
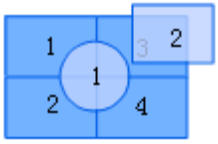
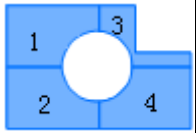
Return Value:

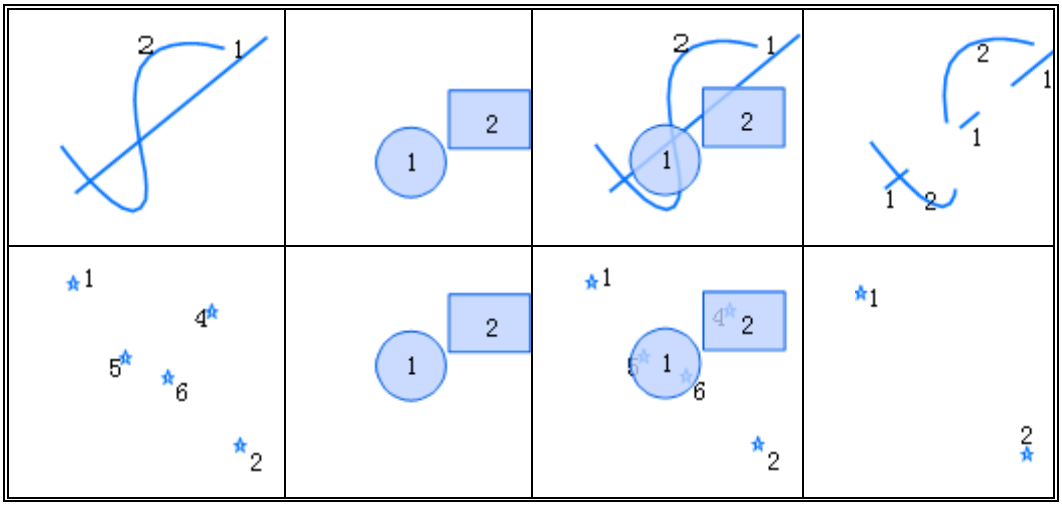
Returns True when erase is achieved, otherwise returns False.

For instance, the Taihu Lake is the third largest freshwater lake, passing three provinces and one city, which are Jiangsu, Zhejiang, Anhui provinces, and Shanghai. In order to get Taihu watershed of Jiangsu province to analyze the land use change, the administrative maps of Zhejiang, Anhui and Shanghai could be used to erase the Taihu Lake map.

The Erase operation diagram:

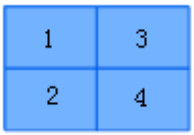
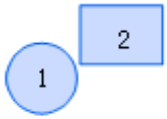
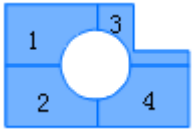
Diagram 4 Erase

The First Dataset (the erased dataset)	The Second Dataset (the erasing dataset)	Overlay Diagram:	resultDataset
			



The property table of the erase operation output consists of properties in the erased dataset, and has the same property table type with the erased dataset. The table below displays the configuration of the property table. All the fields that are not system fields of dataset A have been added automatically.

Table 4 Erase

The First Dataset (A)	The Second Dataset(B)	Output
		
SmID | SmUserID | W 1 | 1 | A 2 | 2 | B 3 | 3 | C 4 | 4 | D	SmID | SmUserID | W 1 | 5 | E 2 | 6 | F	SmID | SmUserID | W 1 | 1 | A 2 | 2 | B 3 | 3 | C 4 | 4 | D

4.4 Intersect

Intersect operation gives the overlap part of two datasets to a result dataset. The First Dataset is an intersected dataset, which is a point, line, region, route, or CAD dataset. The Second Dataset is an

intersecting dataset, which must be a region layer. The elements of the First Dataset intersect with the region boundary of the Second Dataset will be divided up, except the point.

The spatial geometry information produced by the clip operation and intersection operation are the same. However, the clip operation does not change the property table, while intersect operation allows users to keep necessary attributes.

Methods of two datasets intersection, with a regional dataset the Second dataset:

Syntax:

boolean intersect(DatasetVector dataset,DatasetVector IntersectDataset, DatasetVector resultDataset,OverlayAnalystParameter parameter);

Parameters:

dataset: the intersected dataset also named the First Dataset. This dataset could be the point, line or region type.

IntersectDataset: the intersecting dataset, also named the Second Dataset. This dataset must be the region type.

resultDataset: a vector dataset that saves the result of the intersection.

parameter: parameter objects of the overlay analysis, configuration of reserved fields in the analysis as well as other parameters.

Return Value:

Returns True when intersection is achieved, otherwise it returns False.

Methods of two datasets intersection, with the Second Dataset as a region object array dataset:

Syntax:

boolean intersect(DatasetVector dataset,Geometry[] intersectGeometries, DatasetVector resultDataset,OverlayAnalystParameter parameter)

Parameters:

Dataset: the intersected dataset, which could be the point, line, region type.

intersectGeometries: the intersecting region array in the overlay analysis.

resultDataset: a vector dataset that saves the result of the intersection.

parameter: parameter objects of the overlay analysis, configuration of reserved fields in the analysis as well as other parameters.

Return Value:

Returns True when intersection is achieved, otherwise it returns False.

Methods of recordsets intersection:

Syntax:

boolean intersect (Recordset recordset,Recordset intersectRecordset, DatasetVector resultDataset,OverlayAnalystParameter parameter)；

Parameters:

recordset: the intersected recordset, also named the First Recordset, which could be the point, line, region type.

intersectRecordset: the intersecting dataset, also named the Second Recordset, which must be the region type.

resultDataset: a vector dataset that saves the result of the intersection.

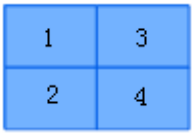
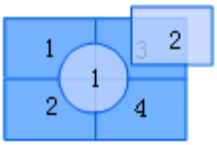
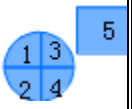
parameter: parameter objects of the overlay analysis, configuration of reserved fields in the analysis as well as other parameters.

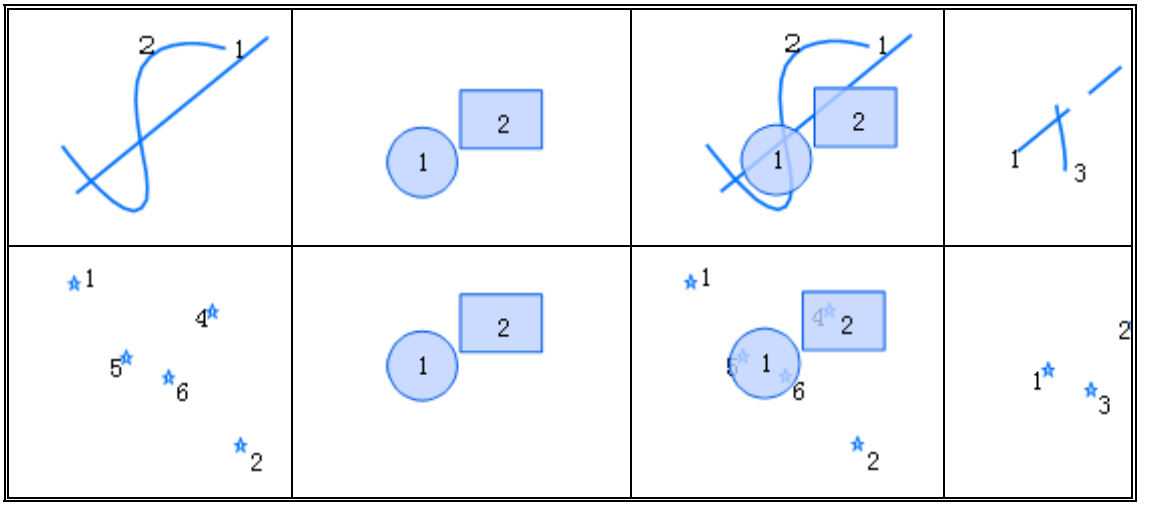
Return Value:

Returns True when intersection is achieved, otherwise it returns False.

For instance, there are two layers that represent Beijing's land use situation in two periods. What we want to get is the land that keeps the same function during these two periods. The intersection operation should be employed to produce the desired result.

Diagram 5 Intersection Operation Diagram

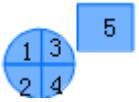
The First Dataset (the intersecting dataset)	the Second Dataset (the intersected dataset)	Overlay Diagram	Result Dataset
			



The property table of the intersection result dataset includes all the attributes of the intersecting layer and the intersected layer, as well as property fields of itself. The users can select the fields to be reserved from the dataset A and B. More information shows in the table blow.

Configuration of the property table: If dataset A and dataset B has different attribute fields, all these attributes will be inherited directly. For instance, both attribute P and Q will be put into the table. If the fields in the dataset A and dataset B are the same, the system will give alias to one of them firstly, and then add them into the result dataset property table, for instance attribute field W.

Table 5 Intersect

The First Dataset (A)	The Second Dataset (B)	Output
		

SmID	W	P
1	A	11
2	B	12
3	C	13
4	D	14

SmID	W	Q
1	E	21
2	F	22

SmID	P	Q	W	W_1
1	11	21	A	E
2	12	21	B	E
3	13	21	C	E
4	14	21	D	E
5	13	22	C	F

4.5 Identity

Identity operation produces a layer has the same region of the First Dataset layer, but includes the geometry shape and attributes data from the Second Dataset layer. If we conduct the intersection to a couple of datasets first, and then union the result layer with the First Dataset, finally we get the identity operation layer. The Second Dataset must be a region type, and the First Dataset could be a point, line, region, or route dataset. If the First Dataset is a point dataset, all the point elements will be kept in the outcome. For the case of line type, the line elements of the First dataset will be kept, and the line will be cut at the cross point. If the First Dataset is a region layer, the regions of the First Dataset will be kept, and the regions overlapped with the Second Dataset will be divided into parts along their crossed borders.

Methods of identity operation to datasets, one of which is a regional dataset as a Second Dataset:

Syntax:

boolean identity(DatasetVector dataset,DatasetVector identityDataset,
DatasetVector resultDataset,OverlayAnalystParameter parameter);

Parameters:

dataset: The First Dataset. This dataset could be the point, line, or region type.

identityDataset: also named the Second Dataset. This dataset must be the region type.

resultDataset: a vector dataset that saves the result of the identity.

parameter: parameter objects of the overlay analysis, configuration of reserved fields in the analysis as well as other parameters.

Return Value:

Returns True when identity is achieved, otherwise it returns False.

Methods of identity operation to the dataset with a regional geometry object array as the Second Dataset:

Syntax:

boolean identity(DatasetVector dataset, Geometry[] identityGeometries,, DatasetVector resultDataset,OverlayAnalystParameter parameter)

Parameters:

dataset: the First Dataset, which could be the point, line, or region type.

identityGeometries: the Second Dataset, which must be a regional geometry object.
resultDataset: a dataset saved the analysis result.

parameter: parameter objects of the overlay analysis, configuration of reserved fields in the analysis as well as other parameters.

Return Value:

Returns True when identity is achieved, otherwise it returns False.

Methods of identity operation to recordsets:

Syntax:

boolean identity (Recordset recordset,Recordset identityRecordset,

DatasetVector resultDataset,OverlayAnalystParameter parameter)；

Parameters:

recordset: the First Recordset, which could be a point, line, or region type.

identityRecordset: the Second Recordset, which must be a region type.

resultDataset: a vector dataset that saves the result of the identity.

parameter: parameter objects of the overlay analysis, configuration of reserved fields in the analysis as well as other parameters.

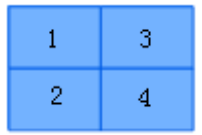
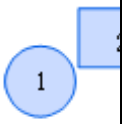
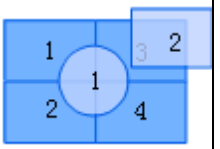
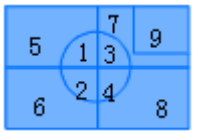
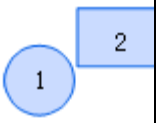
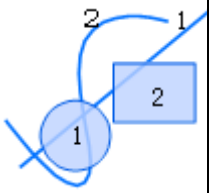
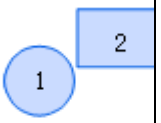
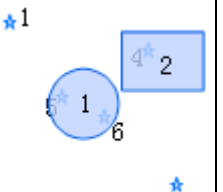
Return Value:

Returns True when identity is achieved, otherwise it returns False.

For instance, if the First Dataset is a National Soil type layer and the Second Dataset is a National climate layer, the identity operation will output a layer including the climate information of the nation soil. We are able to know the soil type of each new polygon and its corresponding climate information.

Identity Operation Diagram:

Diagram 6 Identity Operation Diagram

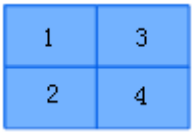
The First Dataset	The Second Dataset	Overlay Diagram	resultDataset
			
			
			

The property table of the output layer consists of the system fields, and the attributes from both of the input layers. Users are allowed to select the necessary fields from the First and Second Dataset according to their own needs.

The configuration of the property table is illustrated as follows. If dataset A and dataset B have different fields name, all the attributes will be added into the property table of the result dataset. For instance, attribute fields P and Q will be automatically added to the property table of the result dataset. If the fields in the dataset A and dataset B are the same, the system will give alias to one of them, and then add them into the property table of the result dataset, for instance attribute field W.

Table 6 Identity

The First Dataset (A)	The Second Dataset (B)	Output



SmID	W	P
1	A	11
2	B	12
3	C	13
4	D	14

SmID	W	Q
1	E	21
2	F	22

SmID	P	Q	W	W_1
1	11	21	A	E
2	12	21	B	E
3	13	21	C	E
4	14	21	D	E
5	11		A	
6	12		B	
7	13		C	
8	14		D	
9	13	22	C	F

4.6 XOR

Symmetric Difference produces a layer consists of the elements of two datasets that are not overlapped. The result of the Symmetric Difference operation removed the features that intersected in the two input layers, and the rest, which are not overlapped, will be kept.

Methods of Symmetric Difference operation to datasets:

Syntax:

boolean xOR(DatasetVector dataset,DatasetVector xORDataset,

DatasetVector resultDataset,OverlayAnalystParameter parameter);

Parameters:

dataset: the First Dataset, which must be the region type.

xORDataset: the Second Dataset, which must be the region type.

resultDataset: a vector dataset that saves the result of the symmetric difference.

parameter: parameter objects of the overlay Analysis, configuration of reserved fields in the analysis as well as other parameters.

Return Value:

Returns True when symmetric difference is achieved, otherwise it returns False.

Methods of symmetric difference operation to recordsets:

Syntax:

boolean xOR (Recordset recordset,Recordset xORRecordset,

DatasetVector resultDataset,OverlayAnalystParameter parameter)

Illustration:

Sysmmetric Difference deletes the regions that contained by the first layer and the second layer.

Parameters:

recordset: the First Record Set, which must be a region type.

xORRecordset: the Second Record Set, which must be a region type.

resultDataset: a vector dataset that saves the result of the symmetric difference.

parameter: parameter objects of the overlay Analysis, configuration of reserved fields in the analysis as well as other parameters.

Return Value:

Returns True when symmetric difference is achieved, otherwise it returns False.

Methods of symmetric difference operation to a regional dataset by a regional object array.

Syntax:

boolean xOR(DatasetVector dataset,Geometry[] xorGeometries, DatasetVector resultDataset,OverlayAnalystParameter parameter)

Illustration:

delete every regional object that contained by the regional object array from the regional dataset.

Parametres:

recordset: the First dataset, which should be a regional type.

xorRecordset: the Second dataset, which should be a regional type.

resultDataset: a vector dataset that saves the result of the symmetric difference.

parameter: parameter objects of the overlay Analysis, configuration of reserved fields in the analysis as well as other parameters.

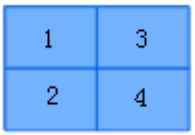
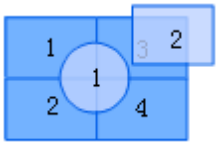
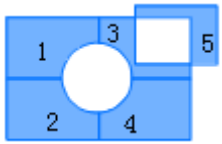
Return Value:

Returns True when symmetric difference is achieved, otherwise it returns False.

For instance, two layers of Beijing land use map in the year of 1995 and 2005 as the input layers, the result layer of the symmetric difference operation shows the changed land from the year of 1995 to 2005.

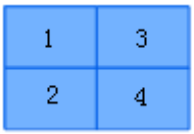
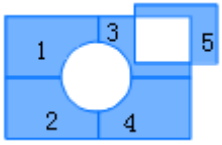
Symmetric Difference Operation Diagram:

Diagram 7 Symmetric Difference Operation Diagram

The First Dataset	The Second Dataset	Overlay illustration	resultDataset
			

The property table of the symmetric difference operation contains none-system attributes of the input datasets. The configuration of the property table shows in the diagram below. If the dataset A and dataset B have different field names, these fields in dataset A and B will be added into the result directly, just like the attribute field P and Q. If the dataset A and B have the same attribute name, the system will give one of them an alias, and then put them into the result dataset, for instance, attribute W.

Table 7 XOR

The First Dataset(A)	The Second Dataset(B)	Output
		

SmID	W	P
1	A	11
2	B	12
3	C	13
4	D	14

SmID	W	Q
1	E	21
2	F	22

SmID	P	Q	W	W_1
1	11		A	
2	12		B	
3	13		C	
4	14		D	
5		22		F

4.7 Update

Update operation is that the updating layer replaces the overlap parts of the updating layer and the updated layer. It is a process of erasing the overlapping and copying features to a result layer. Both of the datasets must be region type. The result dataset keeps the geometry shapes and attribute information in the updating dataset.

✧ Methods of updating a dataset with a regional dataset:

Syntax:

boolean update(DatasetVector dataset,DatasetVector updateDataset,
DatasetVector resultDataset,OverlayAnalystParameter parameter);

Parameters:

dataset: the updated dataset, also named the First Dataset, which must be the region type.

updateDataset: the updating dataset, also named the Second Dataset, which must be the region type.

resultDataset: vector dataset saves the update result.

parameter: parameter objects of the overlay analysis, configuration of reserved fields in the analysis as well as other parameters.

Return Value:

Returns True when update is achieved, otherwise it returns False.

✧ Methods of updating regional dataset by the regional object array:

Syntax:

boolean update(DatasetVector dataset,Geometry[] updateGeometries, DatasetVector resultDataset,OverlayAnalystParameter parameter)

Illustration:

Update overlay analysis to a regional dataset by a regional object array. Update operation used to update the overlapped parts of the polygon dataset and the dataset array. It is a process of erasing and copying.

Parameters:

dataset: the updated dataset, the First Dataset, which must be the region type.

updateGeometries: regional object array for updating.

resultDataset: the vector dataset used to save update result.

parameter: parameter objects of the overlay analysis, configuration of reserved fields in the analysis as well as other parameters.

Return Value:

Returns True when update is achieved, otherwise it returns False.

✧ Methods of updating recordsets:

Syntax:

boolean update (Recordset recordset,Recordset updateRecordset,
DatasetVector resultDataset,OverlayAnalystParameter parameter);

Illustration:

Update overlay analysis to a couple of region recordsets. Update operation used to update the overlapped parts of the polygon dataset and the dataset array. It is a process of erasing and copying.

Parameters:

recordset: the First RecordSet, which must be the region type.

updateRecordset: the Second RecordSet, which must be the region type.

resultDataset: a vector dataset that saves the result of the update.

parameter: parameter objects of the overlay analysis, configuration of reserved fields in the analysis as well as other parameters.

Return Value:

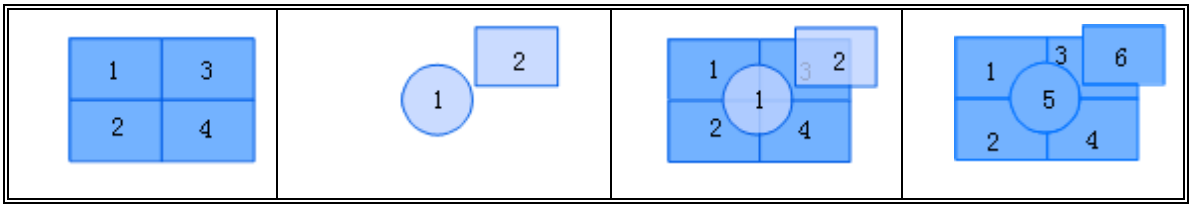
Returns True when update is achieved, otherwise it returns False.

For instance, two input layers represent the National Land Use map and the National Forest Returned from farmland respectively. Update operation produce a layer is the national land use map with the current forests areas.

Update Operation Diagram:

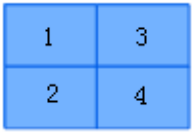
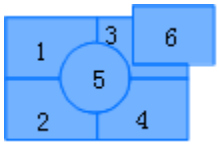
Diagram 8 Update Operation Diagram

The First Dataset (the updated layer)	The Second Dataset (the updating layer)	Overlay Diagram	resultDataset



The property table of the result of Update operation is shown in the following. The property values of the overlap regions of dataset A and B get the property value B.

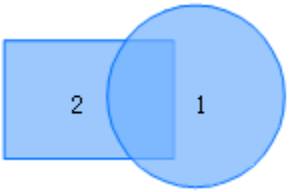
Table 8 Update

The First Dataset (A)	The Second Dataset (B)	Output
		
SmID | SmUserID | W 1 | 1 | A 2 | 2 | B 3 | 3 | C 4 | 4 | D	SmID | SmUserID | W 1 | 5 | E 2 | 6 | F	SmID | W 1 | A 2 | B 3 | C 4 | D 5 | E 6 | F

5 Appendix

The regional datasets used to overlay analysis should not contain regional objects that overlapped. Any regional datasets overlapped are illegal; in this case, the system will not produce reliable overlay results. It is recommended to conduct a topology check before the overlay analysis operation.

Regional Overlap Diagram:

Overlay Illustration	Property Table
	SmID / SmUserID / W 1 / 11 / A 2 / 12 / B

The datasets types for overlay analysis:

Operations:	The First Dataset	The Second Dataset
Clip	point, line, region datasets	region datasets
Erase	point, line, region datasets	region datasets
Identity	point, line, region datasets	region datasets
Intersect	point, line, region datasets	region datasets
Union	region datasets	region datasets
XOR	region datasets	region datasets
Update	region datasets	region datasets