

Geography 360

November 9, 2016

Introduction to Spatial Analysis

1. *Questions and Announcements*

2. *Introduction to Spatial Analysis*

- Queries
- Larger database logic behind the scenes: Relational algebra
- Simple spatial analysis: concept and examples

So, this SQL statement:

```
SELECT <Class, Instructor> FROM <Geography Classes>  
WHERE <Instructor = "Bergmann">
```

might return this result:

Geography Classes

Class	Instructor
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Geog 123	Sparke
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Geog 271	Jarosz
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Geog 360	Bergmann
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Geog 430	Lawson
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Class	Instructor
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Geog 360	Bergmann
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How would you write queries for:

1. All park preserves designated as tiger habitat?

1. `SELECT * FROM Parks WHERE "HabitatDesignation" = "tiger habitat"`

2. Lakes that are more than 300 square miles?

1. `SELECT * FROM Lakes WHERE "LakeArea_sqmi" > 300`

3. Traffic accidents that happened between midnight and 2 a.m. within 500 meters of a bar?

1. `SELECT * FROM Accidents WHERE ("Time">"0000") AND ("Time"<"0200")`

Applying a spatial query to the results of that selection:

`"Distance_from_bar" < 500`

Attribute queries:

Use the proper
'syntax' (see right)

Spatial queries:

Just write out in
words.



```
SELECT * FROM World WHERE:  
"GDP_2003" > 1000000
```

How would you write queries for:

- Traffic accidents that happened between midnight and 2 a.m. within 500 meters of a bar...?
 - First: Find traffic accidents within 500 meters of bar and make that selection its own table, perhaps called 'AccidentsNearBars'
 - Then: `SELECT * FROM AccidentsNearBars WHERE ((Time > 0:00) AND (Time < 2:00))`

Relational Algebra

An abstract language of operations that allow you to manipulate tables and their data.

These operations may, for example:

- combine,
- select,
- or split tables,

...and they often may be configured by setting parameters.

SQL provides you with an implementation of a relational algebra.

Selections are a part of a Relational Algebra

Selection (restriction): reduces one table in the record dimension (a selection of a subset of records, for all fields)

Selection: Find Geography classes taught by Bergmann

Geography Classes

Class	Instructor
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Geog 123	Sparke
Geog 271	Jarosz
Geog 360	Bergmann
Geog 430	Lawson

Result of Selection

Class	Instructor
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Geog 360	Bergmann
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Various operations in a relational algebra

This is what they look like on the database level.

We will see how they look (differently) in the interfaces we use

a) restrict

ID	type	color	size	age
1	a	blue	big	old
2	c	green	big	young
3	a	red	small	mid
4	d	black	big	older
5	x	mauve	tiny	oldest
6	g	dun	huge	young
7	c	ecru	small	mid

restrict



ID	type	color	size	age
1	a	blue	big	old
4	d	black	big	older
6	g	dun	huge	young
2	c	green	big	young

b) project

ID	type	color	size	age
1	a	blue	big	old
2	c	green	big	young
3	a	red	small	mid
4	d	black	big	older
5	x	mauve	tiny	oldest
6	g	dun	huge	young
7	c	ecru	small	mid

project



ID	color	size
1	blue	big
2	green	big
3	red	small
4	black	big
5	mauve	tiny
6	dun	huge
7	ecru	small

Various operations in a relational algebra

(The spatial versions of these are more complex, often splitting features)

a) union

ID	type	color	size	age
1	a	blue	big	old
6	g	dun	huge	young

ID	type	color	size	age
2	c	green	big	young
4	d	black	big	older

union

ID	type	color	size	age
1	a	blue	big	old
4	d	black	big	older
6	g	dun	huge	young
2	c	green	big	young

b) intersect

ID	color	size
1	blue	big
2	green	big
3	red	small
4	black	big
5	mauve	tiny
6	dun	huge
7	ecru	small

ID	color	size
1	blue	big
5	mauve	tiny
9	ivory	big

intersect

ID	color	size
1	blue	big
5	mauve	tiny

Various operations in a relational algebra

(For the quiz, you need to understand these operations in the ways we discuss and employ them elsewhere...not in the formulations they have here.)

c) difference

ID	color	size
1	blue	big
2	green	big
3	red	small
4	black	big
5	mauve	tiny
6	dun	huge
7	ecru	small

ID	color	size
1	blue	big
5	mauve	tiny
9	ivory	big

difference

ID	color	size
2	green	big
3	red	small
4	black	big
6	dun	huge
7	ecru	small

d) join

ID	type
1	a
2	b
3	b
4	a

type	color	size	age
a	blue	big	old
b	dun	tiny	old

join

ID	type	color	size	age
1	a	blue	big	old
2	b	dun	tiny	old
3	b	dun	tiny	old
4	a	blue	big	old

(All from Bolstad 2013)

Spatial Analysis

...is using geographic computational methods to help us discover and understand spatial patterns and relationships within spatial data.

It offers techniques to help ask and answer questions of spatial data.

- Simple: “How long is the Chattahoochee River?”
- More complicated: “If we have a 2 degree temperature increase, how will the spatial distributions of particular species change?”

Spatial Analysis

(precursors, according to popular history)



John Snow, cholera cases in 1854

modern reinterpretations

