Spatial SQL

Spatial Databases

- Database: software to manage data

  add, modify, and query records.

  e.g. transactions, student records, etc.

Std. Id	Last Name	First Name	Street name	City	State	Major

- SQL : Structured Query Language

SQL use cases

- What is the total length of all roads in US?
- What is the largest county in the state of Texas, by area?
- Find all the places where rivers cross the roads in US.

SQL examples

- https://www.w3schools.com/sql/sql_select.asp
- SELECT *column1*, *column2* FROM *table_name*;

  SELECT CustomerName, City FROM Customers;

  SELECT * FROM Customers WHERE Country='UK';

https://www.w3schools.com/sql/trysql.asp?filename=trysql_select_where

Join: https://www.w3schools.com/sql/sql_join.asp

Tools

- Postgres
- Postgis
- Geopandas – Python
- The case for using spatial SQL

https://towardsdatascience.com/the-case-for-using-spatial-sql-1bf25b3b800d

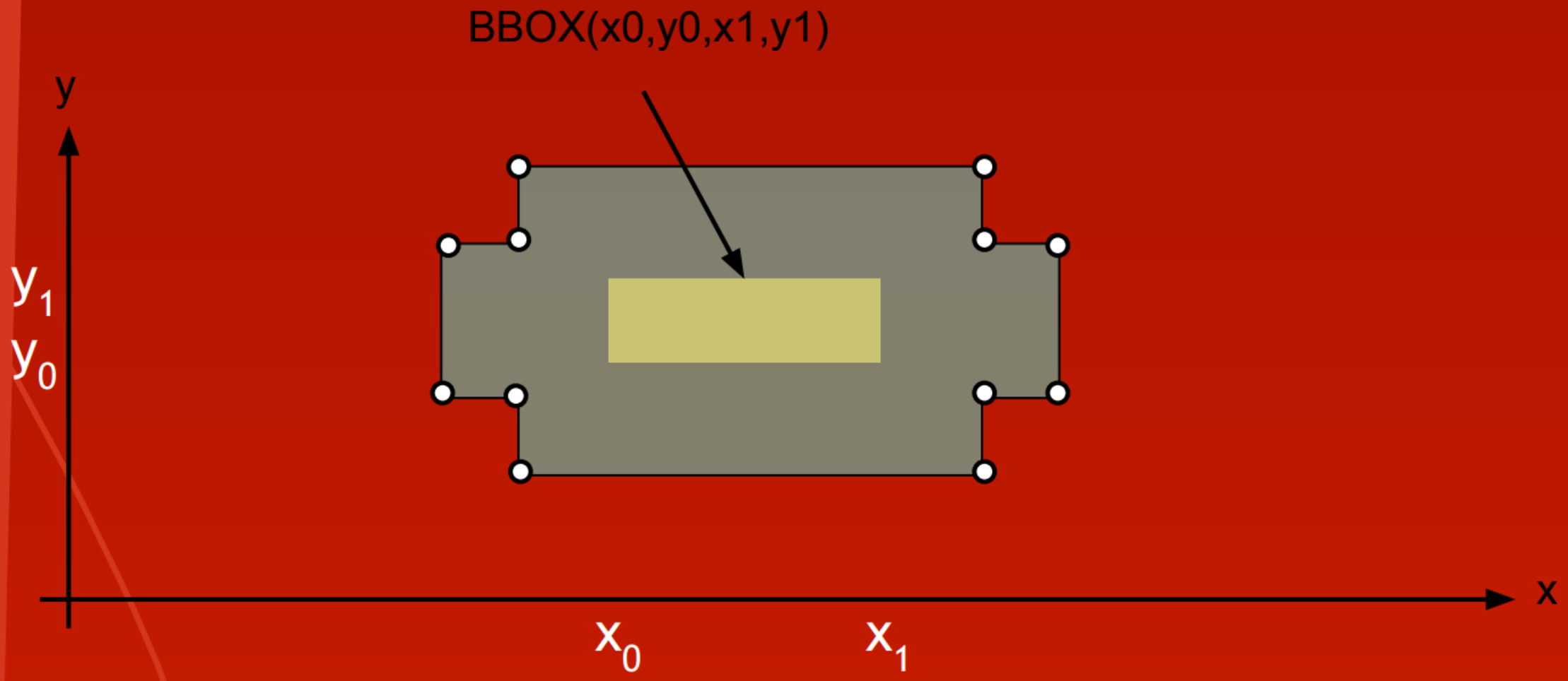
Spatial SQL examples

```
SELECT  ST_Intersection('POINT(0 0)'::geometry, 'LINESTRING ( 2 0, 0 2 )'::geometry);
    GEOMETRYCOLLECTION EMPTY

SELECT ST_Intersection('POINT(0 0)'::geometry, 'LINESTRING ( 0 0, 0 2 )'::geometry);
    POINT(0 0)
```

How to implement e.g. INTERSECT?

SELECT * FROM *R* WHERE INTERSECTS(R.polygon, BBOX(x_0,y_0,x_1,y_1));



Spatial databases (Postgres + PostGIS)

- Select the geometries where the rivers intersect with the state of Texas:

```
SELECT   ST_Intersection( s.geom, r.geom ), s.state, r.river FROM usa_states as s,
                usa_rivers as r WHERE s.state = 'Texas’
```

Table usa_states (s) contains state name “state” and “geom” polygon representation.

Table usa_rivers (r) contains river name “river” and “geom” polyline representation.

Spatial databases (Postgres + PostGIS)

Spatial Join Query (Table A and B each have attribute for geometry geom)

SELECT * from A, B where ST_Intersects(A.geom, B.geom)

QGIS + Postgis

Add data to QGIS and then query

```
select ST_AsText(geom) from "US" limit 3;

select st_area(geom), geom, name from "US" where st_area(geom)>1

select ST_AsText(geom), name from "US" where name='Ferry';
```

https://forrest.nyc/postgis-and-qgis-in-4-minutes/