SQL Server Spatial Data

Jyothirmai Nirdala

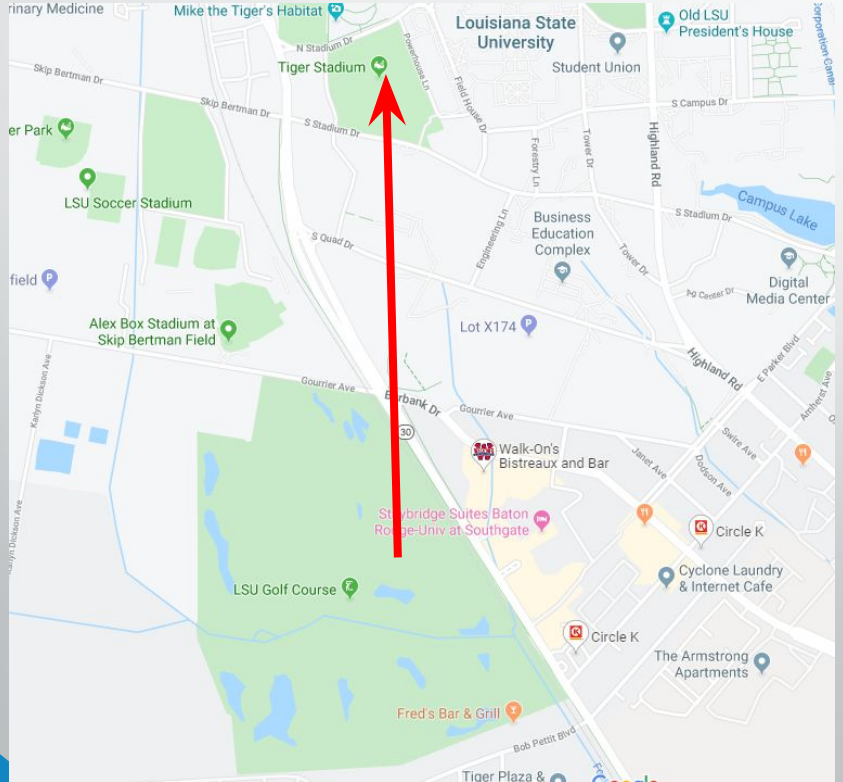
Seyedeh Shaghayegh Rabbanian

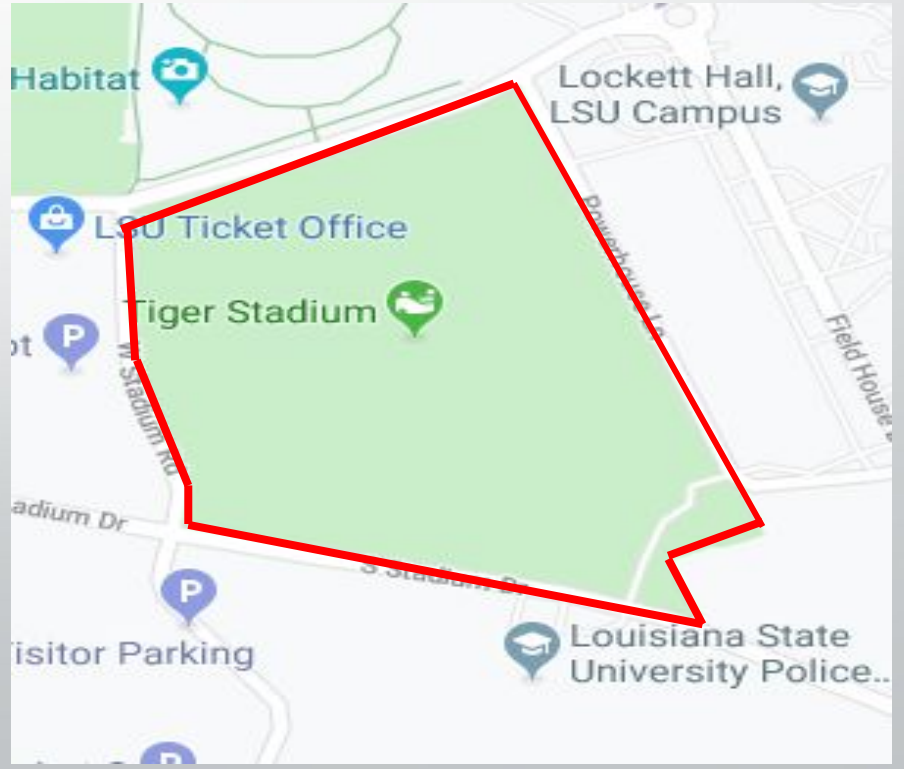
Venkata Mounika Chithirala

What is Spatial Data?

Information about the locations and shapes of geographic features and usually stored as Coordinates and Topology.

Geographic/ Spatial Data identifies the geographic location of features and boundaries on earth.





Applications

Finding nearby Restaurants in Google Maps.

Finding distance from one place to other.

Tracking friends location in Find my Friends app.

Tracking the location of cab in Uber or Lyft

Many more…..

Data Types

- Geometry

  It represents shape of the earth as Flat.

  The most commonly used SRID(will discuss in coming slides) is 0.

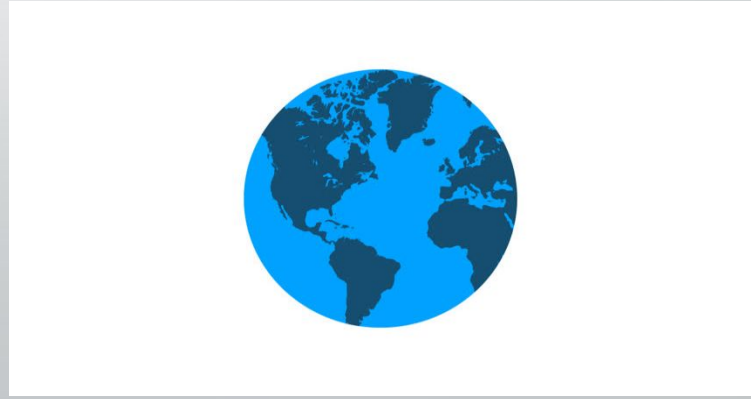
  It uses Cartesian(x and y) coordinate system that represents points,lines and polygons in 2-D spaces

- Geography

  It represents shape of the earth as Round.

  The most commonly used SRID is 4326.

  It uses Latitude and Longitude coordinate system.



Data Objects

- Points
- Line string
- Polygon
- GeometryCollection
- Multi Polygon
- Multi Linestring
- Multi Point
- CircularString
- CompoundCurve

CurvePolygon

Spatial Reference ID

- SRID is a coordinate system to represent relevant model of curvature of the earth to be used in different calculations
- For instance,WGS 84 with SRID=4326 is the most commonly used Spatial Reference Identifier used in GPS.

Methods

- STPolyFromText
- STLineFromText
- STArea
- STLength
- STBuffer
- STContains
- STGeomFromText
- STUnion
- STEquals
- STDifference
- STWithin
- STDistance
- And many other methods for both Geometry and Geography data types

Syntax for Spatial Queries

DataType : Method (Data Objects , SRID)

- Geometry
- Geography

- Area → STArea()
- Length → STLength()
- Buffer → STBuffer()

Examples:

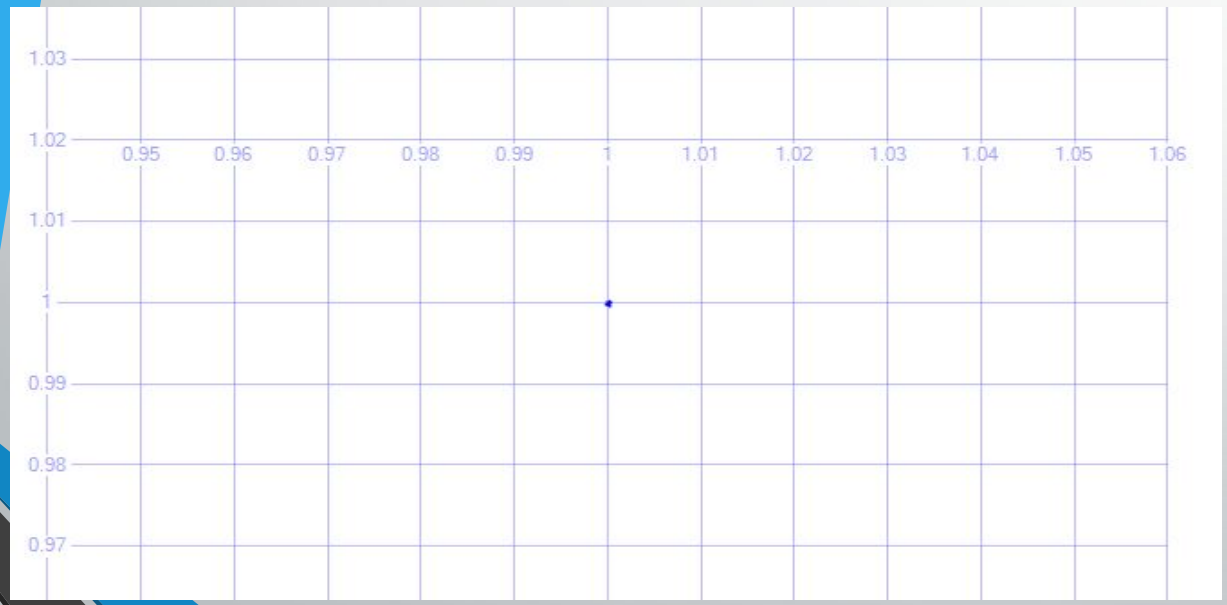
Examples:
- Point(7,4)
- Line(0,2 1,2)

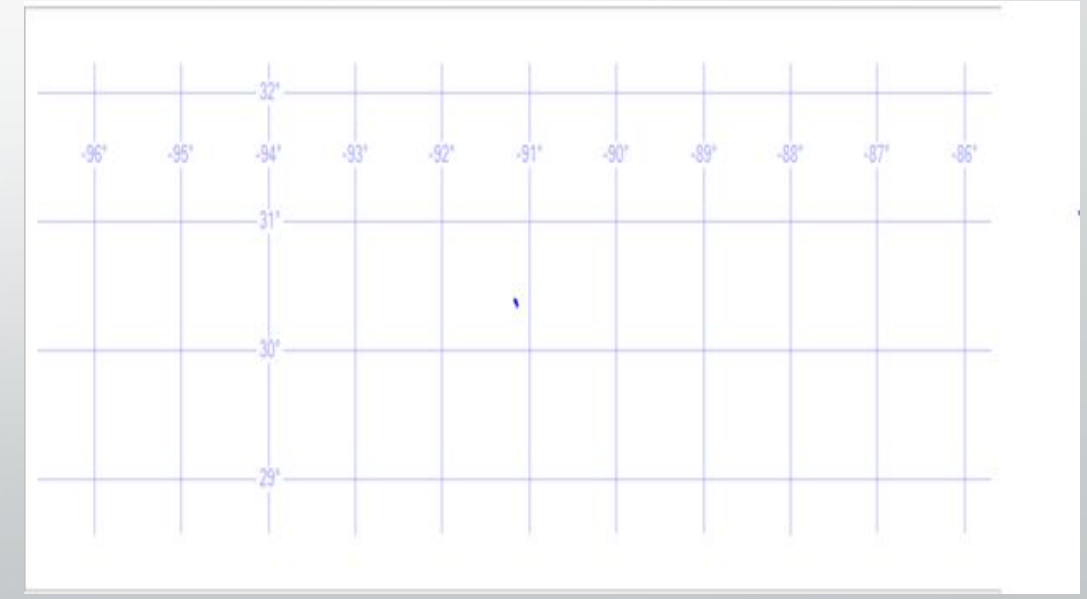
Examples:
- 4326
- 4157

Point

Point is a zero-dimensional representation of a position.

- SELECT geometry::STPointFromText('POINT (1 1)', 0);
- SELECT geography::STPointFromText('POINT (-91.1723711 30.4030881)', 4326);

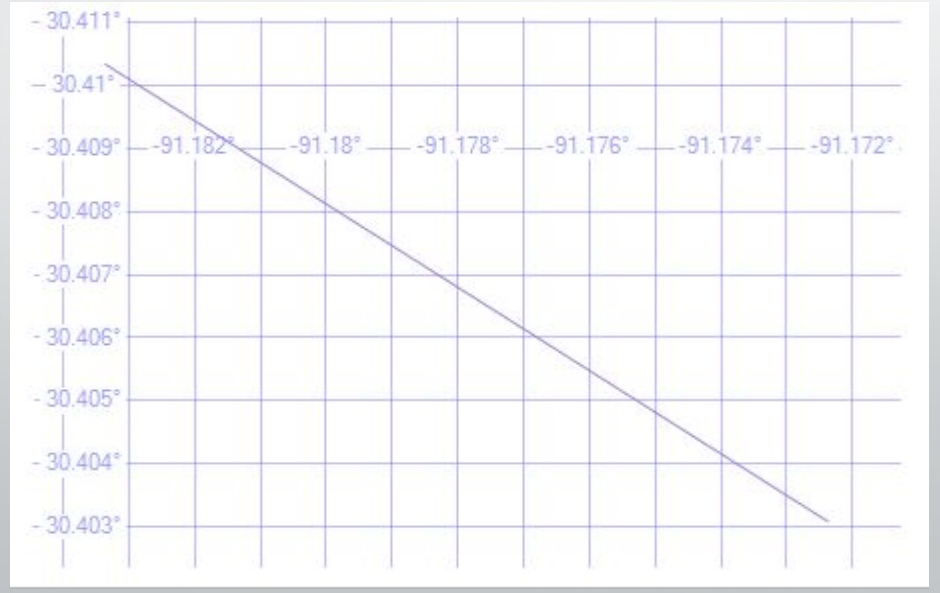


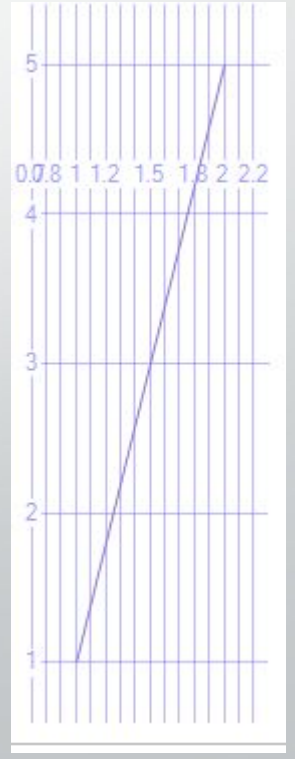


LineString

A series of two or more points connected using straight lines.

- SELECT geography::STLineFromText('LineString(-91.1723711 30.4030881, -91.183353 30.4103395)',4326)
- SELECT geometry::STLineFromText('LineString (1 1, 2 5)', 0);



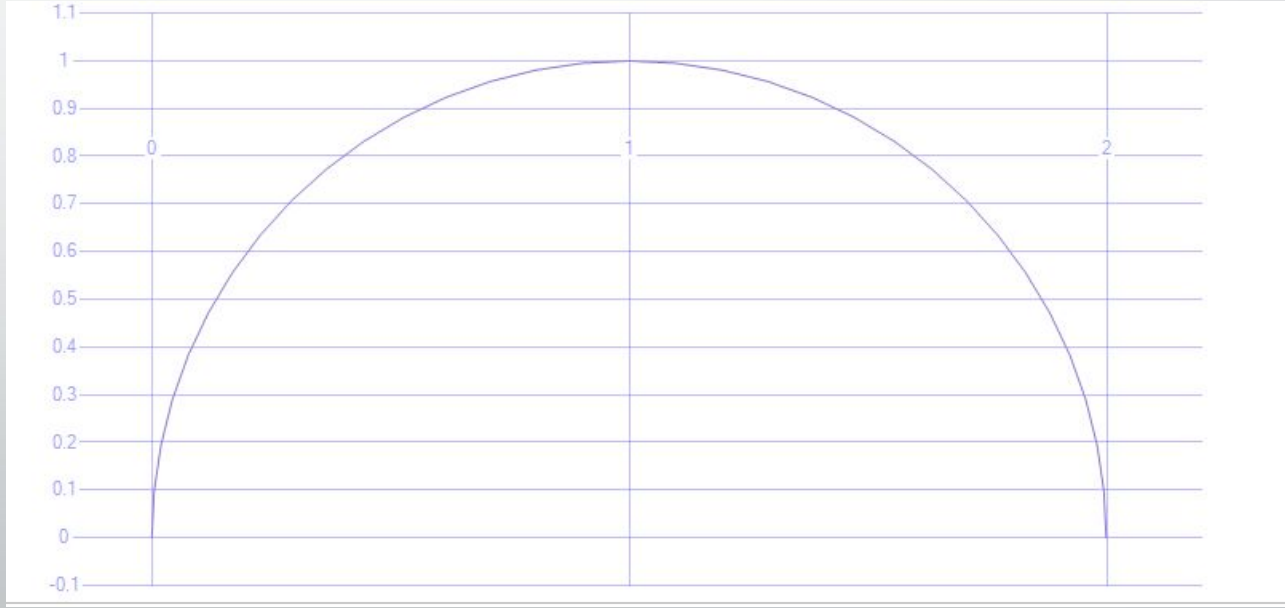


CIRCULARSTRING

It is used to represent curve lines.

- SELECT geometry::STGeomFromText('CIRCULARSTRING(2 0, 1 1, 0 0)', 0)

1. Number of points can be odds only and it will not accept even number of points.(3,5,7,...)

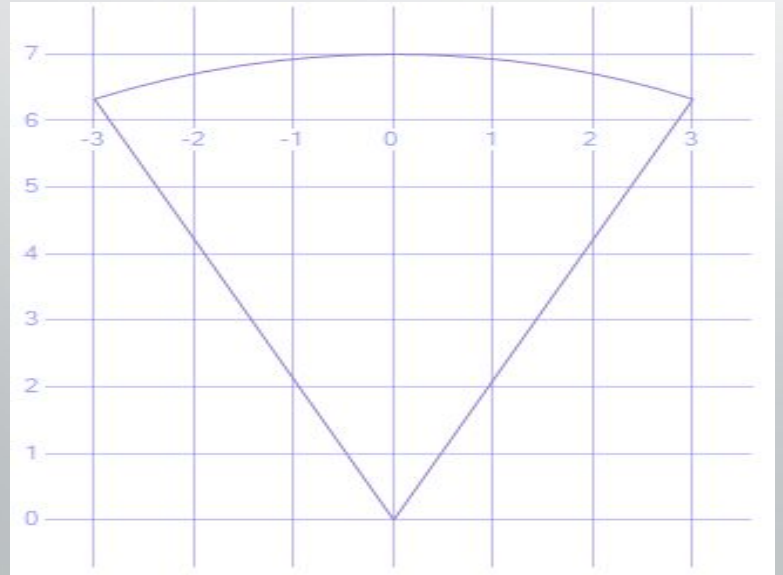


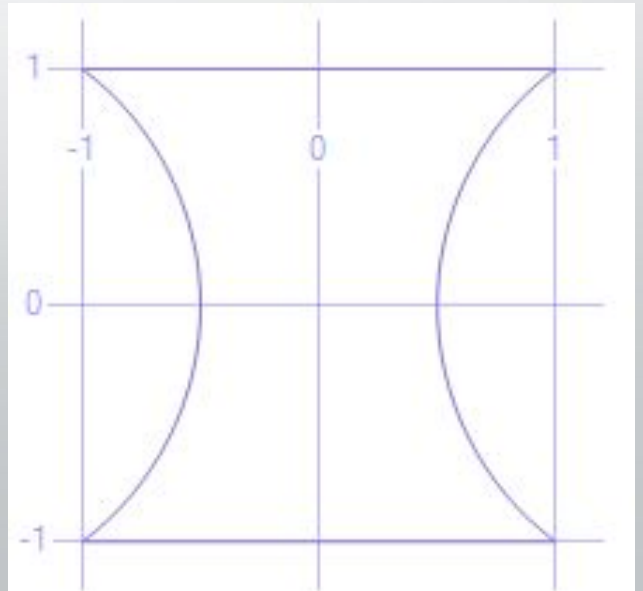
COMPOUNDCURVE

It is used to represent a combination of lines and curves.

- SELECT geometry::STGeomFromText('COMPOUNDCURVE(CIRCULARSTRING(0 0, 1 2.1082, 3 6.3246, 0 7, -3 6.3246, -1 2.1082, 0 0))', 0)
- Select geometry::STGeomFromText

('COMPOUNDCURVE(CIRCULARSTRING(-1 -1,-0.5 0,-1 1),(-1 1,1 1),CIRCULARSTRING(1 1,0.5 0,1 -1),(1 -1,-1 -1))',0)

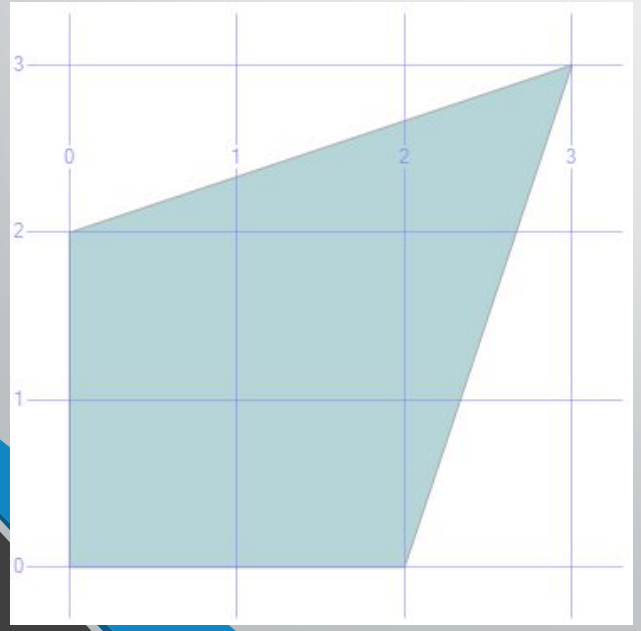


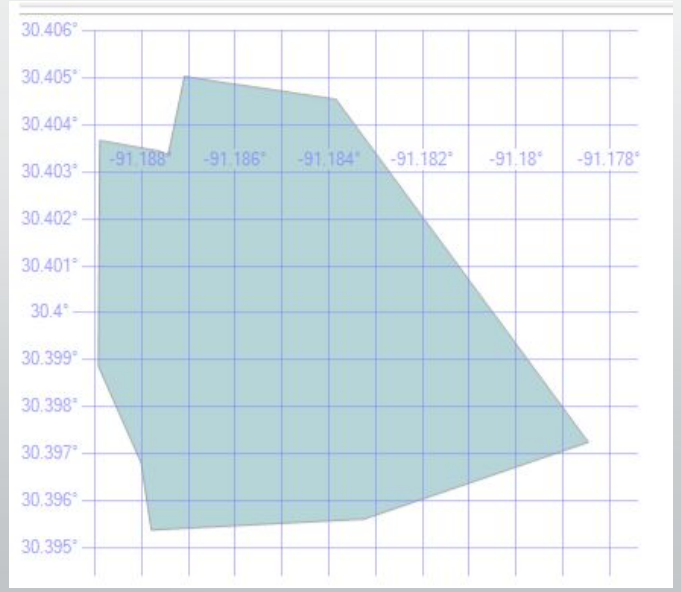


POLYGON

Polygon is used to represent a boundary of a location.

- SELECT geometry::STPolyFromText('POLYGON((0 0, 0 2, 3 3, 2 0, 0 0))', 0);
- SELECT Geography::STPolyFromText('POLYGON((-91.178451 30.397243, -91.183844 30.404556, -91.185807 30.404849, -91.186258 30.404912, -91.187084 30.405044,-91.187423 30.403418, -91.187485 30.40339, -91.187632 30.403453, -91.188894 30.403677, -91.188923 30.398865, -91.188010 30.396811, -91.187792 30.395371, -91.183243 30.395604, -91.178451 30.397243))', 4326);

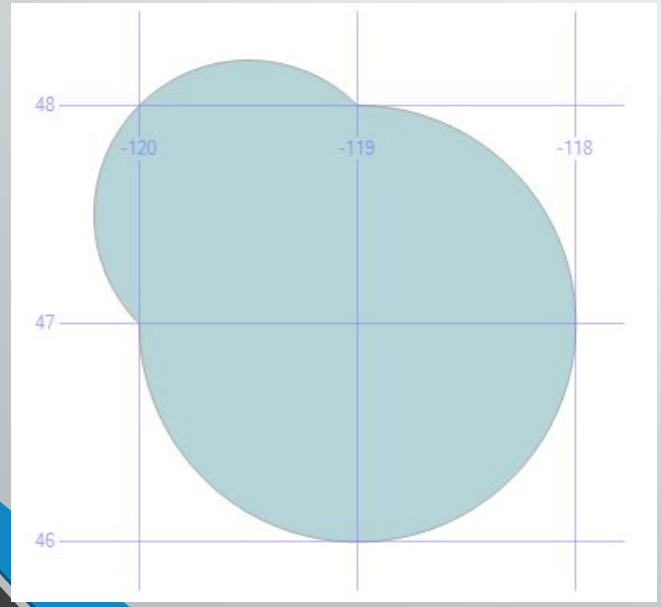


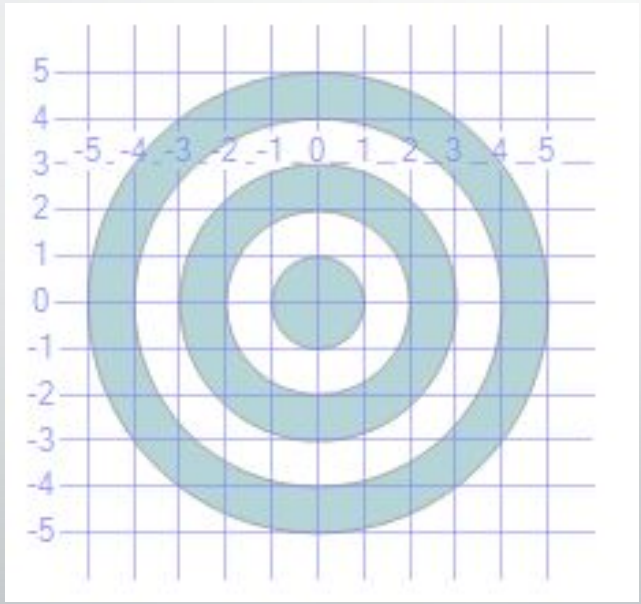


1. With at least 4 points.
2. To have a closed shape, starting point and ending point should be the same.

CURVEPOLYGON

- SELECT geometry::STGeomFromText('CURVEPOLYGON(CIRCULARSTRING(-120 47, -119 46, -119 48, -120 48, -120 47))', 0)
- Select geometry::STGeomFromText ('CURVEPOLYGON(CIRCULARSTRING(0 5,-5 0,0 -5,5 0,0 5),CIRCULARSTRING(0 4,-4 0,0 -4,4 0,0 4), CIRCULARSTRING(0 3,-3 0,0 -3,3 0,0 3), CIRCULARSTRING(0 2,-2 0,0 -2,2 0,0 2) ,CIRCULARSTRING(0 1,-1 0,0 -1,1 0,0 1))',0)

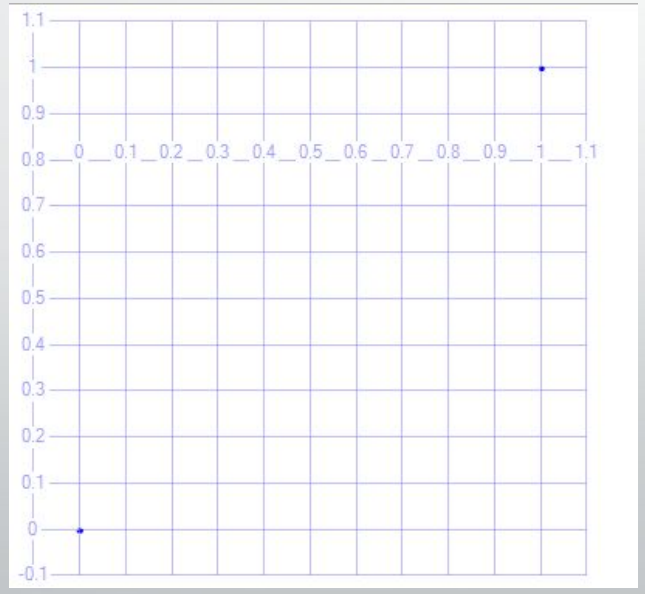




1. With at least 4 points.
2. To have a closed shape, starting point and ending point should be the same.

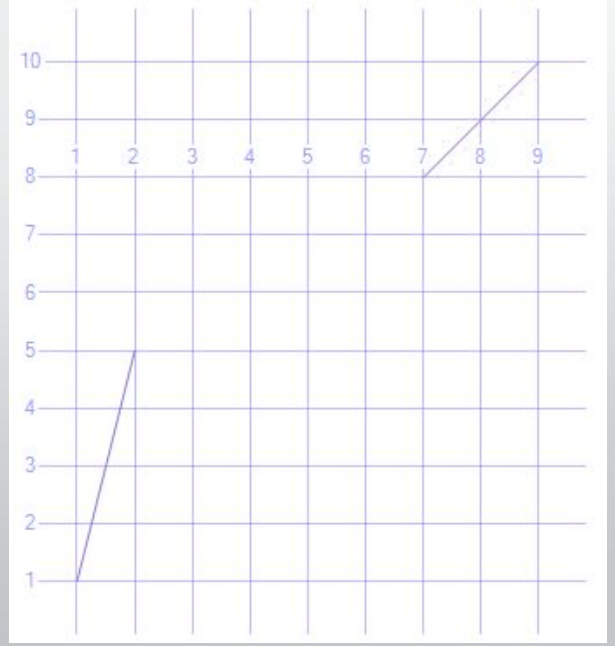
MULTIPOINT

- SELECT geometry::STGeomFromText('MULTIPOINT((0 0), (1 1))', 0)



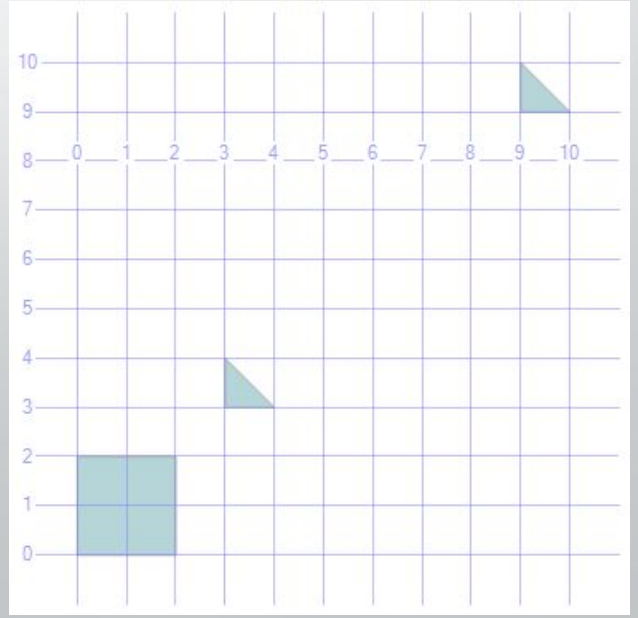
MULTILINESTRING

- SELECT geometry::STGeomFromText('MULTILINESTRING((1 1, 2 5), (7 8, 9 10))', 0)



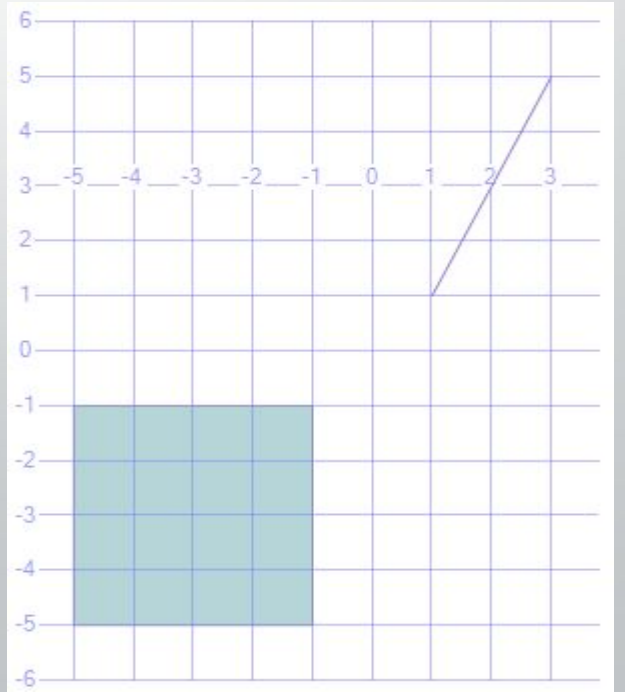
Multi Polygon

- SELECT geometry::STGeomFromText('MULTIPOLYGON(((0 0, 0 2,2 2, 2 0, 0 0), (3 3 , 3 4 , 4 3, 3 3)), ((9 9, 9 10, 10 9, 9 9)))' , 4326)



GEOMETRYCOLLECTION

- SELECT geometry::STGeomFromText('GEOMETRYCOLLECTION(LINESTRING(1 1, 3 5),POLYGON((-1 -1, -1 -5, -5 -5, -5 -1, -1 -1)))' , 4326)



Questions?