CSCI – 585 DATABASE SYSTEMS

Submitted By: Manish Dhankani

Homework 3: Spatial Database

Part1: KML File for 10 Locations:

starter_kml.kml

```
<?xml version="1.0" encoding="utf-8" ?>
<kml xmlns="http://www.opengis.net/kml/2.2">
<Document id="Locations">
<Folder><name>Databases - HW3</name>
 <Placemark>
        <name>Mardi Gras Apt</name>
        <description>My Home</description>
   <Point><coordinates>-118.279890,34.028428</coordinates></Point>
 </Placemark>
 <Placemark>
        <name>Expo/Vermont</name>
        <description>USC Corridor</description>
   <Point><coordinates>-118.291521,34.018717</coordinates></Point>
 </Placemark>
 <Placemark>
        <name>Vermont/Jeff</name>
        <description>USC Corridor</description>
   <Point><coordinates>-118.291526,34.025952</coordinates></Point>
```

```
</Placemark>
<Placemark>
        <name>Jeff/Figueroa</name>
        <description>USC Corridor</description>
   <Point><coordinates>-118.280345,34.022387</coordinates></Point>
</Placemark>
<Placemark>
        <name>Figueroa/Expo</name>
        <description>USC Corridor</description>
   <Point><coordinates>-118.281684,34.019381</coordinates></Point>
</Placemark>
<Placemark>
        <name>Olin Hall</name>
        <description>Database Class</description>
   <Point><coordinates>-118.289662,34.020910</coordinates></Point>
</Placemark>
<Placemark>
        <name>Leavey Library</name>
        <description>My Second Home</description>
   <Point><coordinates>-118.282973,34.022087</coordinates></Point>
</Placemark>
<Placemark>
        <name>Ralphs</name>
        <description>Supermarket</description>
   <Point><coordinates>-118.290803,34.032059</coordinates></Point>
</Placemark>
<Placemark>
        <name>Ronal Tutor Center</name>
        <description>USC Cafe place</description>
```

<Point><coordinates>-118.286508,34.020485</coordinates></Point>

</Placemark>

<Placemark>

<name>Blaze Pizza</name>

<description>Pizza Center!</description>

<Point><coordinates>-118.279501,34.023538</coordinates></Point>

</Placemark>

</Folder>

</Document></kml>

Explanation:

1. Mardi Gras Apt: My Home place as mentioned in the 1a of Homework.
2. Exposition/Vermont: I was at the campus and as mentioned in 1b of Homework.
3. Vermont/Jefferson: I was at the campus and as mentioned in 1b of Homework.
4. Jefferson/Figueroa: I was at the campus and as mentioned in 1b of Homework.
5. Figueroa/Exposition: I was at the campus and as mentioned in 1b of Homework.
6. Olin Hall: The Databases Class room as I'm on campus student.
7. Leavey Library: The most common study place for On campus student.
8. Ralphs: The Supermarket place, near by the Campus (a different location as mentioned on Discussion).
9. Ronald Tutor Center: Café Center inside the Campus premises.
10. Blaze Pizza: Famous Pizza restaurant near by Campus.

Part 2&3: Queries for Step 4.

Table Creation:

CREATE TABLE GLOBAL_POINTS (ID INT PRIMARY KEY, NAME VARCHAR (20) NOT NULL, LONGITUDE DOUBLE PRECISION NOT NULL, LATITUDE DOUBLE PRECISION NOT NULL, LOCATION GEOMETRY(POINT, 4326));

QUERIES:

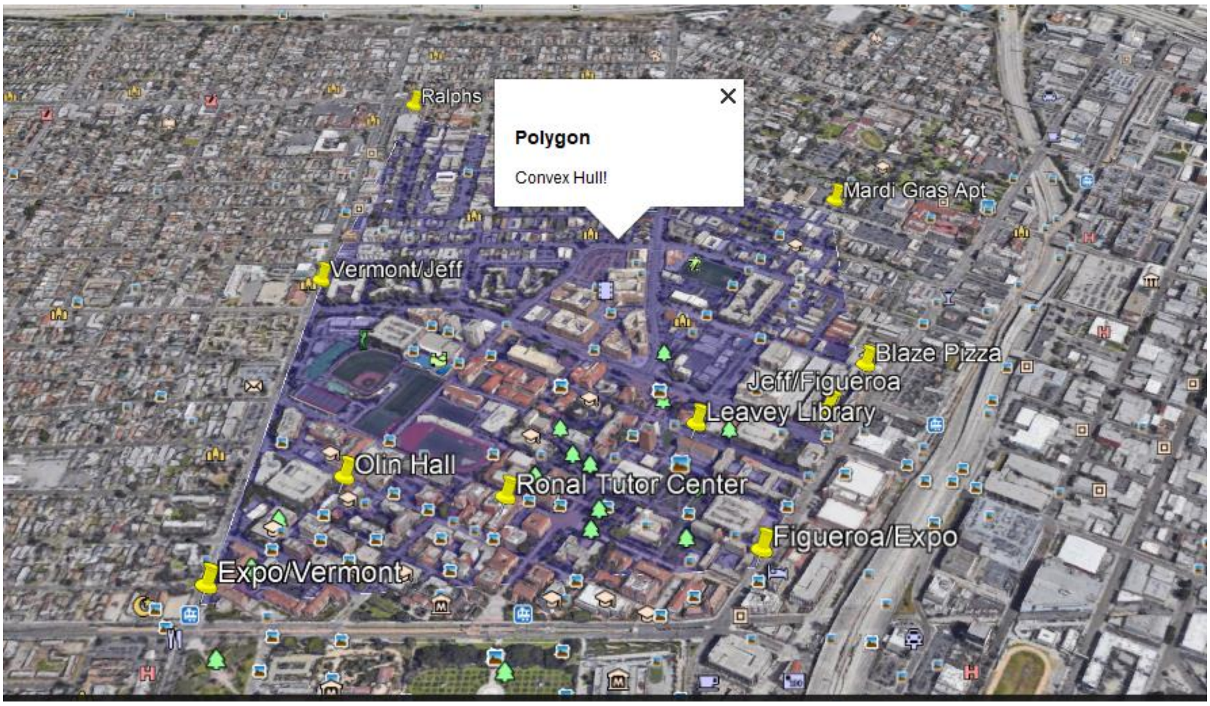
4A) 1. Compute Convex Hull:

SELECT ST_AsText(ST_ConvexHull(ST_Collect(LOCATION))) from GLOBAL_POINTS;

Query Output on Google Cloud:

```
spatialdb=> SELECT ST_AsText(ST_ConvexHull(ST_Collect(LOCATION))) from GLOBAL_POINTS;
                                                                 st_astext
-------------------------------------------------------------------------------------------------------------------------------------------------------------
 POLYGON((-118.291521 34.018717,-118.291526 34.025952,-118.290803 34.032059,-118.27989 34.028428,-118.279501 34.023538,-118.281684 34.019381,-118.291521 34.018717))
(1 row)
```

Query Output on Google Earth(Screenshot for Convex Hull of 10 Locations):



2. KML File for Convex Hull Polygon:

```
<?xml version="1.0" encoding="utf-8" ?>
<kml xmlns="http://www.opengis.net/kml/2.2">
<Document id="Locations">
<Folder><name>Databases - HW3</name>
<Placemark>
 <name>Polygon</name>
 <description>Convex Hull!</description>
    <Polygon>
     <outerBoundaryIs>
      <LinearRing>
       <coordinates>
        -118.291521,34.018717,
        -118.291526,34.025952,
        -118.290803,34.032059,
        -118.27989,34.028428,
        -118.279501,34.023538,
        -118.281684,34.019381,
        -118.291521,34.018717
       </coordinates>
      </LinearRing>
     </outerBoundaryIs>
    </Polygon>
    <Style>
     <PolyStyle>
      <color>#50F00014</color>
      <width>5</width>
      <outline>1</outline>
```

```
      </PolyStyle>
    </Style>
  </Placemark>
</Folder>
</Document>
</kml>
```

4B) Polygons Disjoint:

KML File for 2 polygons:

```
<?xml version="1.0" encoding="utf-8" ?>
<kml xmlns="http://www.opengis.net/kml/2.2">
<Document id="Locations">
<Folder><name>Databases - HW3</name>
  <Placemark>
  <name>Polygon1</name>
  <description>Region1(Points#1,2,3,9,10) </description>
    <Polygon>
      <outerBoundaryIs>
        <LinearRing>
          <coordinates>
           -118.279890,34.028428,
           -118.291521,34.018717,
           -118.291526,34.025952,
           -118.286508,34.020485,
           -118.279501,34.023538
          </coordinates>
        </LinearRing>
      </outerBoundaryIs>
    </Polygon>
```

```
    <Style>
      <PolyStyle>
        <color>#5014F000</color>
        <width>5</width>
        <outline>1</outline>
      </PolyStyle>
    </Style>
</Placemark>
<Placemark>
<name>Polygon2</name>
<description>Region2(Points#4,5,6,7,8)</description>
    <Polygon>
      <outerBoundaryIs>
        <LinearRing>
          <coordinates>
           -118.280345,34.022387,
           -118.281684,34.019381,
           -118.289662,34.020910,
           -118.282973,34.022087,
           -118.290803,34.032059
          </coordinates>
        </LinearRing>
      </outerBoundaryIs>
    </Polygon>
    <Style>
      <PolyStyle>
        <color>#5014F0FF</color>
        <width>5</width>
        <outline>1</outline>
```

</PolyStyle>

</Style>

</Placemark>

</Folder>

</Document></kml>

QUERIES:

SELECT ST_Disjoint('POLYGON((-118.279890 34.028428, -118.291521 34.018717, -118.291526 34.025952, -118.286508 34.020485, -118.279501 34.023538, -118.279890 34.028428))'::geometry,

'POLYGON ((-118.280345 34.022387, -118.281684 34.019381, -118.289662 34.020910, -118.282973 34.022087, -118.290803 34.032059, -118.280345 34.022387))'::geometry);

Query Output on Google Cloud:

```
spatialdb=> SELECT ST_Disjoint('POLYGON((-118.279890 34.028428, -118.291521 34.018717, -118.291526 34.025952, -118.286508 34.020485, -118.279501 34.023538,
spatialdb'> -118.279890 34.028428))'::geometry,
spatialdb(> 'POLYGON((-118.280345 34.022387, -118.281684 34.019381, -118.289662 34.020910, -118.282973 34.022087, -118.290803 34.032059, -118.280345 34.022387))'::geometry);
 st_disjoint
-------------
 f
(1 row)
```

Query Output on Google Earth:

Part 4: Issue met in this Home work:

1. To find Postgres query command for Convex Hull using ST_Collect and ST_AsText(Error: No function matches the given name and argument types. You might need to add explicit type casts).
2. To use .kml file for the latitude and longitude coordinates on Google Earth
3. To find Postgres query command for Disjoint using ST_Disjoint(Error: geometry contains non-closed rings).
4. To plot the polygon using the Xml tags(Didn't know the xml tags for Polygon).
5. Mapping of Latitudes and longitudes on kml file to form Epitrochoid curve.

Solutions:

1. Searched on Google and Stack Overflow to get the similar query.
   Imported Extension postgis for using Geometry.
2. Found how to place coordinates for latitude and longitude in Kml file and select Temporary place to visualize it on Google Earth(Discussion Forum and Google search).
3. Searched on Stack Overflow and Stack Exchange GIS for 2nd query and got a similar error solution which fixed my query.
4. Got the example from http://dagik.org/kml_intro/E/polygon.html.
5. Figured out using the trial and error method for mapping of coordinates to kml file.

BONUS QUESTION:

1. Code for point generation:

```
import java.lang.Math; // headers MUST be above the first class

// one class needs to have a main() method
public class HW3
{
 // arguments are passed using the text field below this editor
 public static void main(String[] args)
 {
        double ohe_lat = 34.0208930;
  double ohe_lon = -118.2894404;
        double a=5;
        double b=3;
        double c=5;
        double n=6;
        for(double t=0.0;t<(Math.PI*n);t=t+0.01){
          double x=(a+b)*Math.cos(t)- c*Math.cos(((a/b)+1)*t);
          double y=(a+b)*Math.sin(t)- c*Math.sin(((a/b)+1)*t);

          double ex= 10*((x*Math.PI)/180) + ohe_lat;
          double ey= 10*((y*Math.PI)/180) + ohe_lon;
          System.out.print(ey);
          System.out.print(",");
          System.out.print(ex);
        }
 }
}
```

2. Contents of .kml file(few):

```
<?xml version="1.0" encoding="utf-8" ?>
<kml xmlns="http://www.opengis.net/kml/2.2">
<Document id="root_doc">
<Folder><name>Databases - HW3</name>
<Placemark>
<LineString><coordinates>
-118.2894404,34.5444917755983
-118.29874629743361,34.544732225379335
-118.30803704573044,34.54545336108569
-118.317297507379,34.54665454196331
```

-118.32651256810998,34.54833470060926
-118.3356671484965,34.55049234375201
-118.34474621552928,34.55312555334317
-118.35373479415854,34.55623198795968
-118.36261797879413,34.55980888451565
-118.3713809447559,34.56385306028254
-118.38000895966583,34.568360915216196
-118.3884873947739,34.57332843458919
-118.39680173620955,34.5787511919265
-118.40493759615046,34.58462435224243
-118.41288072390091,34.590942675576564
-118.42061701687156,34.59770052082609
-118.42813253145273,34.604891849871834
-118.43541349377365,34.612510231995095
-118.44244631033946,34.62054884858202
-118.44921757853886,34.62900049811224
-118.45571409701436,34.63785760142824
-118.46192287588812,34.64711220728155
-118.46783114683555,34.65675599815203
-118.47342637299991,34.66678029633579
-118.4786962587404,34.67717607029773
-118.4836287592069,34.68793394128395
-118.48821208973443,34.69904419018929
-118.49243473505067,34.710496764675284
-118.49628545828958,34.72228128653327
-118.49975330980517,34.73438705928748
-118.50282763577847,34.74680307603263
-118.50549808661196,34.75951802750052
</coordinates></LineString>
</Placemark>
</Folder>
</Document></kml>

3. Screenshot of Epitrochoid: