

## CSCI 585 Summer 2019 HW3

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### **Assignment Tasks (6pts)**

1. You need to create (generate) [latitude,longitude] spatial coordinates for 11 locations.

I choose the following points which I usually go, including supermarkets, gym, classroom and libraries, etc.

Spatial coordinates:

1. Home: 34.027606, -118.277477
2. Ralphs: 34.032470, -118.290866
3. Trader Joe's: 34.026388, -118.284064
4. Lyon Center: 34.024645, -118.288356
5. OHE: 34.021051, -118.289705
6. Doheny Library: 34.020536, -118.283632
7. Leavey Library: 34.021999, -118.282813
8. Expo / Vermont: 34.018496, -118.291525
9. Jefferson / Vermont: 34.025450, -118.291418
10. Jefferson / Figueroa: 34.021999, -118.280088
11. Figueroa / Exposition: 34.018496, -118.282384

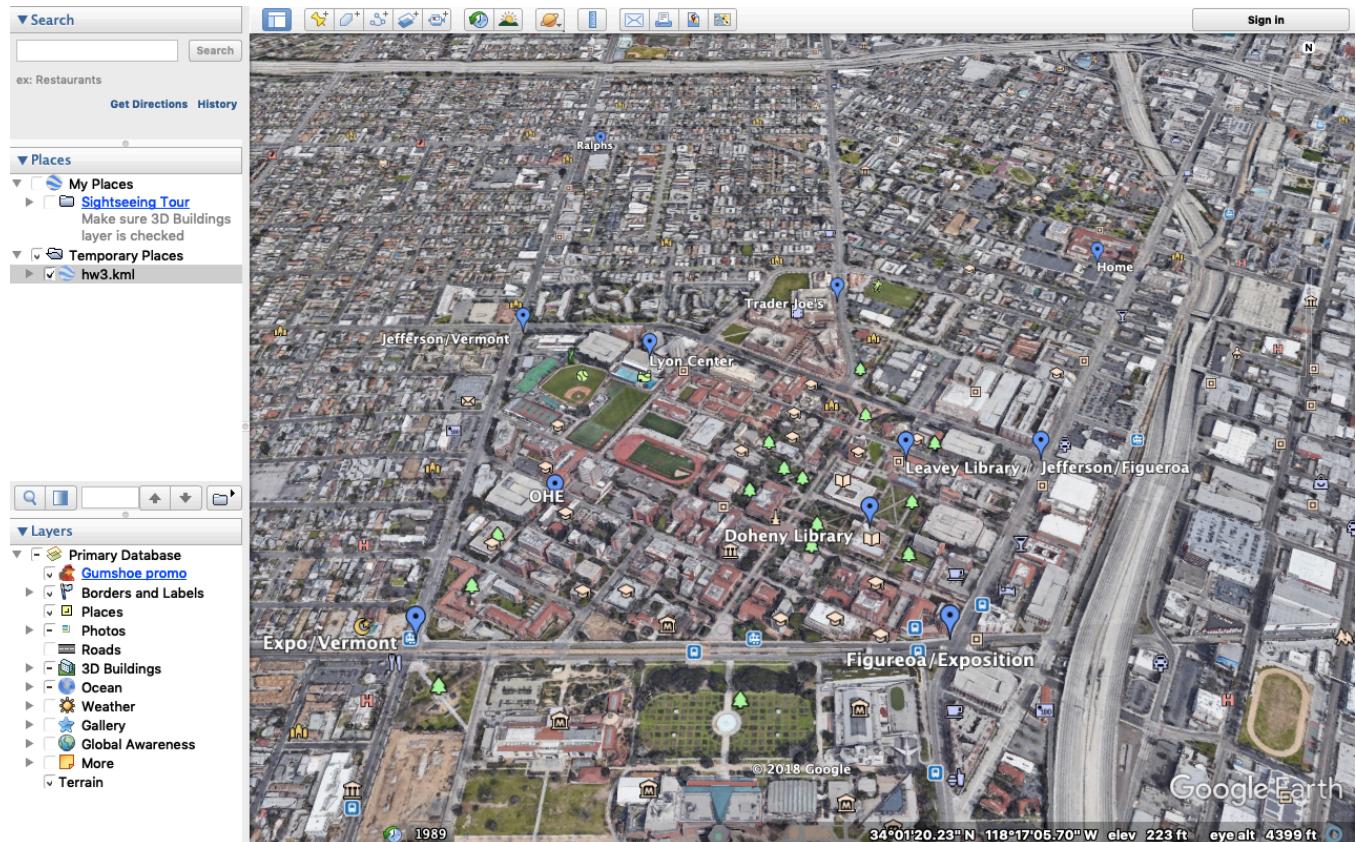
2. Now that you have 11 coordinates and their label, you are going to create a KML file (.kml format) out of them using a text editor.

### **locations.kml**

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://earth.google.com/kml/2.0">
  <Document>
    <Style id="z1">
      <IconStyle><Icon><href>http://www.google.com/intl/en_us/mapfiles/ms/micons/blue-dot.png</href></Icon></IconStyle>
    </Style>
    <Placemark><name>Home</name>
      <styleUrl>#z1</styleUrl><Point><coordinates>-118.277477,34.027606</coordinates></Point>
    </Placemark>
    <Placemark><name>Ralphs</name>
      <styleUrl>#z1</styleUrl><Point><coordinates>-118.290866,34.032470</coordinates></Point>
    </Placemark>
    <Placemark><name>Trader Joe's</name>
```

```
<styleUrl>z1</styleUrl><Point><coordinates>-  
118.284064,34.026388</coordinates></Point>  
</Placemark>  
<Placemark><name>Lyon Center</name>  
<styleUrl>z1</styleUrl><Point><coordinates>-  
118.288356,34.024645</coordinates></Point>  
</Placemark>  
<Placemark><name>OHE</name>  
<styleUrl>z1</styleUrl><Point><coordinates>-  
118.289705,34.021051</coordinates></Point>  
</Placemark>  
<Placemark><name>Doheny Library</name>  
<styleUrl>z1</styleUrl><Point><coordinates>-  
118.283632,34.020536</coordinates></Point>  
</Placemark>  
<Placemark><name>Leavey Library</name>  
<styleUrl>z1</styleUrl><Point><coordinates>-  
118.282813,34.021999</coordinates></Point>  
</Placemark>  
<Placemark><name>Expo/Vermont</name>  
<styleUrl>z1</styleUrl><Point><coordinates>-  
118.291525,34.018496</coordinates></Point>  
</Placemark>  
<Placemark><name>Jefferson/Vermont</name>  
<styleUrl>z1</styleUrl><Point><coordinates>-  
118.291418,34.025450</coordinates></Point>  
</Placemark>  
<Placemark><name>Jefferson/Figueroa</name>  
<styleUrl>z1</styleUrl><Point><coordinates>-  
118.280088,34.021999</coordinates></Point>  
</Placemark>  
<Placemark><name>Figureoa/Exposition</name>  
<styleUrl>z1</styleUrl><Point><coordinates>-  
118.282384,34.018496</coordinates></Point>  
</Placemark>  
</Document>  
</kml>
```

3. Load your kml file into Google Earth - that should show you your 11 sampled locations, on Google Earth's globe :) Take a snapshot (screengrab) of this, for submitting.



4. You need to use the above software to execute the following two spatial queries that you will need to write:

a. 1) compute the convex hull for your 11 points

#### Query:

```
CREATE EXTENSION postgis;
```

```
SELECT ST_AsText(ST_ConvexHull(ST_Collect(ST_GeomFromText('MULTIPOINT(-118.277477
34.027606, -118.290866 34.032470, -118.284064 34.026388, -118.288356 34.024645,
-118.289705 34.021051, -118.283632 34.020536, -118.282813 34.021999, -118.291525
34.018496, -118.291418 34.025450, -118.280088 34.021999, -118.282384 34.018496)'))) );
```

#### Query's result:

```
st_astext
```

---

```
POLYGON((-118.291525 34.018496,-118.291418 34.02545,-118.290866 34.03247,-
118.277477 34.027606,-118.280088 34.021999,-118.282384 34.018496,-118.291525
34.018496))
(1 row)
```

**Screenshot:**

```
postgres=> SELECT ST_AsText(ST_ConvexHull(ST_Collect(ST_GeomFromText('MULTIPOINT(-118.277477 34.027606, -118.290866
34.032470, -118.284064 34.026388, -118.288356 34.024645, -118.289705 34.021051, -118.283632 34.020536, -118.282813 3
4.021999, -118.291525 34.018496, -118.291418 34.025450, -118.280088 34.021999, -118.282384 34.018496)'')) );
st_astext
-----
-----+
POLYGON((-118.291525 34.018496,-118.291418 34.02545,-118.290866 34.03247,-118.277477 34.027606,-118.280088 34.02199
9,-118.282384 34.018496,-118.291525 34.018496))
(1 row)
```

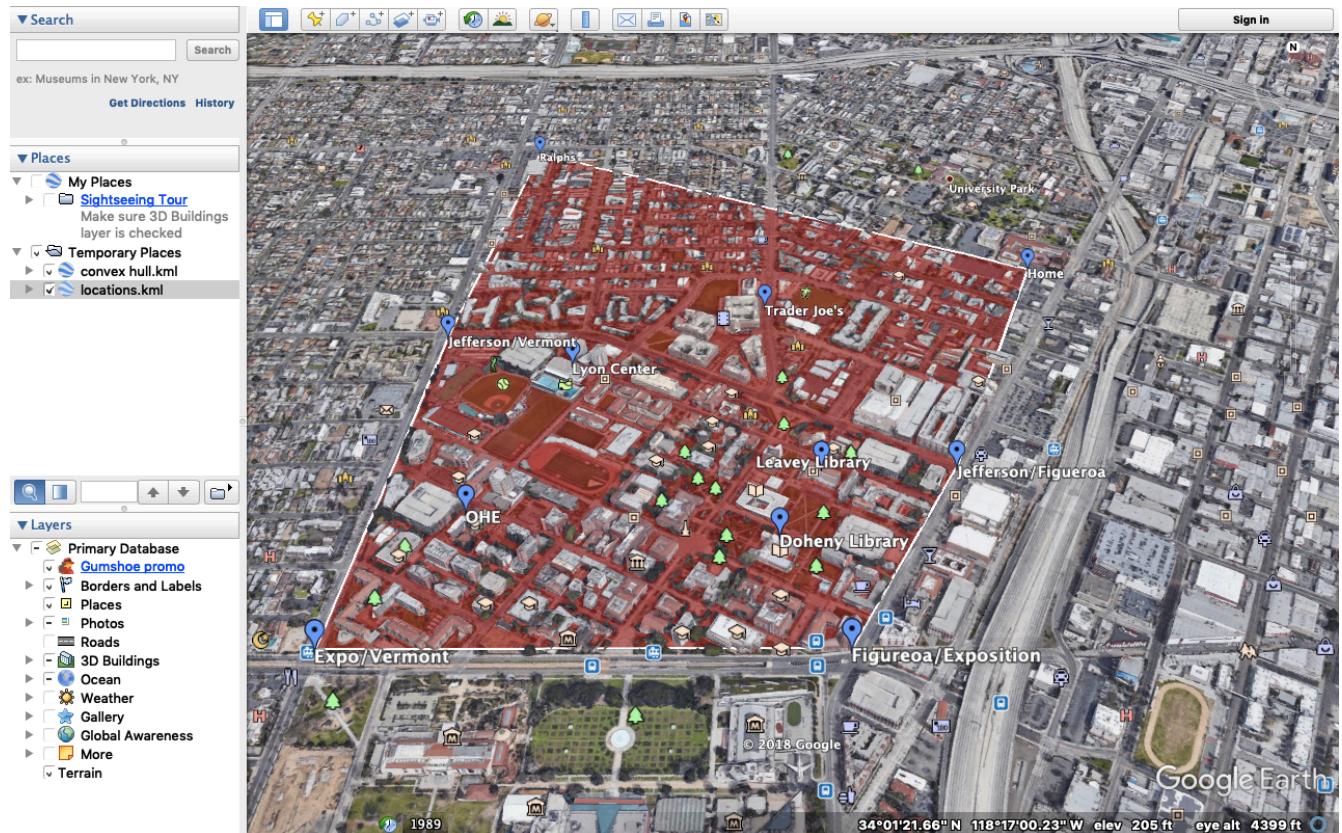
4.

- a. 2) Use the query's result polygon's coords, to create a polygon in your .kml file

**Convex hull.kml**

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2">
  <Document>
    <Style id="transRedPoly">
      <LineStyle>
        <width>3.0</width>
      </LineStyle>
      <PolyStyle>
        <color>7d0000ff</color>
      </PolyStyle>
    </Style>
    <Placemark>
      <name>Convex Hull</name>
      <styleUrl>#transRedPoly</styleUrl>
      <Polygon>
        <extrude>1</extrude>
        <outerBoundaryIs>
          <LinearRing>
            <coordinates>
              -118.291525,34.018496,0
              -118.291418,34.02545,0
              -118.290866,34.03247,0
              -118.277477,34.027606,0
              -118.280088,34.021999,0
              -118.282384,34.018496,0
              -118.291525,34.018496,0
            </coordinates>
          </LinearRing>
        </outerBoundaryIs>
      </Polygon>
    </Placemark>
  </Document>
</kml>
```

## Screenshot:



b. assuming the points (your collected locations) are called #1,#2,#3,...#11, create a polygon using your points #1,#2,#3,#9,#10,#11 (in that order), and another polygon with the remaining points in order (#4,#5,#6,#7,#8). Then write a query to find out if the two polygons disjoint - the result would be (Boolean) true or false, depending on your coordinates.

## Query:

```
SELECT ST_Disjoint('POLYGON((-118.291525 34.018496,-118.291418 34.02545,-118.290866
34.03247,-118.277477 34.027606,-118.280088 34.021999,-118.282384 34.018496,-
118.291525 34.018496))'::geometry, 'POLYGON((-118.283632 34.020536,-118.389705
34.021051,-118.284064 34.26388,-118.282813 34.021999,-118.283632 34.020536,-
118.283632 34.020536))'::geometry);
```

## Query's result:

```
st_disjoint
-----
f
(1 row)
```

## Screenshot:

```
postgres=> SELECT ST_Disjoint('POLYGON((-118.291525 34.018496,-118.291418 34.02545,-118.290866 34.03247,-118.277477 34.027606,-118.280088 34.021999,-118.282384 34.018496,-118.291525 34.018496)')::geometry, 'POLYGON((-118.283632 34.020536,-118.283632 34.020536,-118.21051,-118.284064 34.026388,-118.282813 34.021999,-118.283632 34.020536)')::geometry';
st_disjoint
-----
f
(1 row)
```

## Polygons disjoint.kml:

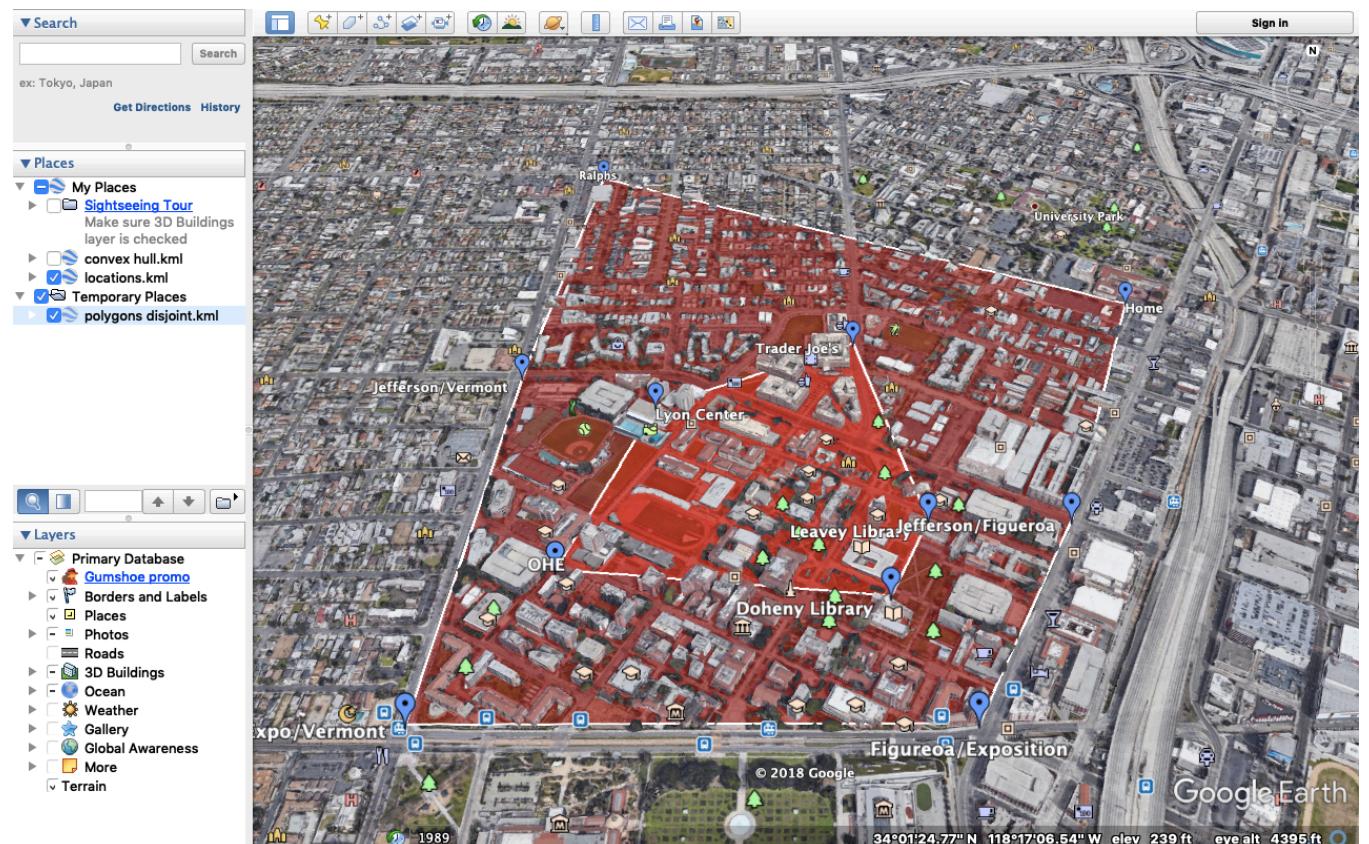
```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2">
  <Document>
    <Style id="transRedPoly">
      <LineStyle>
        <width>3.0</width>
      </LineStyle>
      <PolyStyle>
        <color>7d0000ff</color>
      </PolyStyle>
    </Style>
    <Placemark>
      <name>Polygons Disjoint</name>
      <styleUrl>#transRedPoly</styleUrl>
      <MultiGeometry>
        <Polygon>
          <outerBoundaryIs>
            <LinearRing>
              <coordinates>
                -118.283632,34.020536,0
                -118.289705,34.021051,0
                -118.288356,34.024645,0
                -118.284064,34.026388,0
                -118.282813,34.021999,0
                -118.283632,34.020536,0
              </coordinates>
            </LinearRing>
          </outerBoundaryIs>
        </Polygon>
        <Polygon>
          <outerBoundaryIs>
            <LinearRing>
              <coordinates>
                -118.291525,34.018496,0
                -118.291418,34.02545,0
                -118.290866,34.03247,0
                -118.277477,34.027606,0
                -118.280088,34.021999,0
              </coordinates>
            </LinearRing>
          </outerBoundaryIs>
        </Polygon>
      </MultiGeometry>
    </Placemark>
  </Document>
</kml>
```

```

-118.282384,34.018496,0
-118.291525,34.018496,0
</coordinates>
</LinearRing>
</outerBoundaryIs>
</Polygon>
</MultiGeometry>
</Placemark>
</Document>
</kml>

```

### Screenshot:



## Issues

At Task 4.a), when I ran the query, it showed the following error:

*ERROR: function st\_geomfromtext(unknown) does not exist  
LINE 1: SELECT ST\_AsText(ST\_ConvexHull(ST\_Collect(ST\_GeomFromText('M...  
^*

*HINT: No function matches the given name and argument types. You might need to add explicit type casts.*

Then I googled this error, then figured out that I need to add a query first as follows:

*CREATE EXTENSION postgis;*

Then it works.

Also, there were several format issues about coordinates when I was doing this homework, such as spaces, commas, etc. Another major issue that I met is how to write xml/kml file. I did not find any instructions from our homework document, but I found it's very similar with html. I hope I could get more resources or tutorials about xml.

### Draw a Curve (1pt)

Using a selected point (such as OHE) as the center, compute (don't use GPS!) a set (sequence) of lat-long (ie. spatial) coordinates that lie along a pretty Epicycloid curve :). Create a new KML file with these points, visualize it on Google Earth, submit these three items: your point generation code (see below), the resulting .kml file content (including first 10 coordinates) and a screenshot.

#### Point generation code:

```
<!DOCTYPE html>
<html>
  <head>
    <title>EpicyCloid Curve</title>
  </head>
  <body>
    <canvas id="myCanvas" width="500" height="300" style="border:1px solid #d3d3d3;">
    </canvas>
    <script>
      var a=7, b=3;
      var x0=a, y0=0;
      var c = document.getElementById("myCanvas");
      var ctx = c.getContext("2d");
      ctx.moveTo(150+10*x0, 150+10*y0);

      var cos=Math.cos, sin=Math.sin, pi=Math.PI, nRev=10;
      for (var t=0.0; t<(pi*nRev);t+=0.01) {
        var x=(a+b)*cos(t) - b*cos((a/b+1)*t);
        var y=(a+b)*sin(t) - b*sin((a/b+1)*t);
        ctx.lineTo(150+10*x, 150+10*y);
        document.write(-118.289705+y/1000,",",34.021051+x/1000,"<br>");
      }
      ctx.stroke();
    </script>
  </body>
</html>
```

**Epicycloid curve.kml (including first 10 coordinates):**

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2">
  <Document>
    <Style id="simpleStyle">
      <LineStyle>
        <width>10</width>
      </LineStyle>
      <PolyStyle>
        <color>#0000ff</color>
      </PolyStyle>
    </Style>
    <Placemark><name>OHE</name>
      <styleUrl>#z1</styleUrl><Point><coordinates>-
118.289705,34.021051</coordinates></Point>
    </Placemark>
    <Placemark>
      <name>Polygons Disjoint</name>
      <styleUrl>#simpleStyle</styleUrl>
        <Polygon>
          <outerBoundaryIs>
            <LinearRing>
              <coordinates>
                -118.289705,34.028051
                -118.28970498314916,34.02805216651652
                -118.28970486521783,34.02805566426456
                -118.28970454524791,34.028061487841654
                -118.289703922526,34.028069628250506
                -118.28970289670536,34.02808007290926
                -118.28970136792759,34.02809280566583
                -118.28969923694352,34.02810780681629
                -118.28969640523374,34.02812505312733
                -118.289692775128,34.02814451786274
              </coordinates>
            </LinearRing>
          </outerBoundaryIs>
        </Polygon>
      </Placemark>
    </Document>
  </kml>
```

## Screenshot:

