Homework 2
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Q 3.2 :
Universal Transverse Mercator (UTM): set theory
geodesic distance: metric space
direction (e.g. North, East): Graph Theory
shortest path (for driving on urban roads): Graph Theory
boundary: topology
space-filling curves (Fig. 6.8, pp. 234): Fractal Geometry
planar configurations such as polygons: Euclidean space
straight-line distance: metric space
convex polygon: Euclidean space
landslide probability (chapter 9.4, pp. 350): topology
interior: topology
symmetric relationship: set theory
complement: set theory
exterior: topology

Q 3.4 :
Cylindrical: Topological
Azimuthal (projection onto a plane): Projective
upside down (South up): Affine

Q 4.2
1 local
2 zonal
3 zonal
4 focal
5 focal
6 zonal
7 zonal

Q4.4
1. Austria **<u>is inside</u>** Europe
2. USA **<u>meets</u>** Canada
3. Europe **<u>meets</u>** Asia
4. Lake Superior **<u>overlaps</u>** USA
5. Turkey **<u>overlaps</u>** Europe
6. Lesotho **<u>is inside</u>** South Africa

Trend 2

From team 1’s narratives and presentations, we could know it talks about the time. At beginning, it introduces a brief history of time. Then, it explains two different information systems, one is temporal information system and the other one is spatiotemporal information system. At last, it talks about the index and queries.

The article mainly presents two types of database systems and their query languages for defining, modeling (representing) and operating the moving objects. Two abstractions are mentioned firstly, one is the moving point the other is moving region. A new concept call 'dynamic attributes' is used in the MOST Model to relate the time changing factors to queries. Then, the article discusses about the spatio-temporal data perspective.

Team 9 introduced eight concepts, which are National Spatial Data Infrastructure (NSDI), ISO 191xx Standards, OGC Web Services, Remote sensing, ArcGIS, Intergraph Applications, UMN Mapserver, and Mobile P2P database. For each concept, team 9 gave brief introductions about the application areas and advantages of the technique. For NSDI, they also introduced the core components.

From team 9’s summary, I can see there are mainly three categories of GIS data architectures. They are Hybrid systems, integrated systems, and composable systems. There are a couple different architecture types related to the locations of data storage and processing, such as the mainframe system, client-server architecture, and terminal architecture.

I would like to make one suggestion for team 9’s slide. If a list of title or a catalog added before the introduction, I will have a better understanding about the contents they are going to talk.

Project 2

We talked about UMN Parking App with Prof. Shekhar, and we found our biggest challenge is the data source. How could we motivate users to provide their location and information about the parking lots? This will make the application useless if no one willing to provide data. Prof. Shekhar encouraged us to think about something more related to our course and indicated doing some research on the basic concepts about geolocation will be much more fit in our project.

Since our interests are about web developments, we would like to change our project to Geolocation application in HTML5. Teacher assistant Michael Evans shared us an idea about Limited access to the websites with specified geolocation in order to improve the internet security. We starts to read a paper “Localizing the Internet: Implications of and Challenges in Geo-locating Everything Digital” wrote by Michael R. Evans and Chintan Patel. In the paper, it mainly introduced the idea of how a geo-coded Internet will increase the security of Internet and the current challenges threat our Internet. The paper first introduced three benefits which geo-coding Internet will bring to us. The first benefit is geo-coded Internet will facilitate local businesses’ prosperity. The second, geo-coded Internet will improve the network security. The last, geo-coded Internet will build up civility among people. Then, the major challenges are listed in order to realize a geo-coded Internet. This paper only introduced the basic concept about geo-coded Internet and the benefits the geo-coded Internet will bring to the cyber world. However, nothing implementation related details have been talk about. Also, some points made by the authors are not convincing due to not talk about the details, such as how geo-coded Internet could improve privacy and security when some part of Internet traffic was routed through China. When talked about building civility through geo-coded Internet, my biggest concern is what makes civilized communication sometimes difficult to achieve in cyber world? How can geo-coded Internet improve civility among people? The answer of those questions cannot be found in this paper, and the explanation for geo-coded Internet will build civility looks too short and simple in this paper. However, the advantages of geo-coded Internet are obvious. To realize geo-coded Internet is a complicated work and cannot be done in a short time.

In our project, we are not able to build a geo-coded Internet. We would like to implement a limited accessed website based on specified geolocation, which is a smaller concept than geo-coded Internet. This technique can be implemented in some top classified organizations which require the user's location in order to reduce hacker's attacks. We are going to use geolocation technique build-in HTML5 to determine users' location as the geolocation is such an incredible functionality to the browser. "The Geolocation API defines a high-level interface to location information associated only with the device hosting the implementation, such as latitude and longitude. The API itself is agnostic of the underlying location information sources". We can write geolocation application for the web directly in the browser.

Reference

Localizing the Internet: Implications of and Challenges in Geo-locating Everything Digital, Michael R. Evans, Chintan Patel

Geolocation API Specification, http://dev.w3.org/geo/api/spec-source.html

Lab2

Single Table Spatial Queries

1. List the area of each forest in the natural table. (Hint: SDO_GEOM.SDO_AREA)

```
SELECT n.type, SDO_GEOM.SDO_AREA(n.geom, m.diminfo) as area
FROM F12C5980G20.NATURAL n, user_sdo_geom_metadata m
WHERE m.table_name = 'NATURAL' AND m.column_name = 'GEOM' AND  n.type =
'forest';
```

1553 rows selected.

2. What is the area of the largest park in the natural table?

```
select max(area) from (SELECT SDO_GEOM.SDO_AREA(n.geom, m.diminfo) as area
FROM F12C5980G20.NATURAL n, user_sdo_geom_metadata m
WHERE m.table_name = 'NATURAL' AND m.column_name = 'GEOM' AND  n.type = 'park');

 MAX(AREA)
----------
.000116154
```

3. Provide an Minimum Orthogonal Bounding Rectangle (MBR) for "Rue Saint Vincent" in the roads_major table (Hint:SDO_GEOM.SDO_MBR)

```
select SDO_GEOM.SDO_MBR(c.geom, m.diminfo)
from F12C5980G20.ROADS_MAJOR c,user_sdo_geom_metadata m
where m.table_name='ROADS_MAJOR' and m.column_name='GEOM' and c.name='Rue
Saint Vincent';

SDO_GEOM.SDO_MBR(C.GEOM,M.DIMINFO)(SDO_GTYPE, SDO_SRID, SDO_POINT(X, Y, Z),
SDO_
--------------------------------------------------------------------------------
--
SDO_GEOMETRY(2003, NULL, NULL, SDO_ELEM_INFO_ARRAY(1, 1003, 3),
SDO_ORDINATE_ARR
AY(-72.835569, 19.9386124, -72.830725, 19.9397461))
```

4. What is the centroid of "Parque Central" in the natural table? (Hint: SDO_GEOM.SDO_CENTROID)

```
select n.name, SDO_GEOM.SDO_CENTROID(n.geom,m.diminfo)
from F12C5980G20.NATURAL n,user_sdo_geom_metadata m
where m.table_name = 'NATURAL' AND m.column_name = 'GEOM' AND n.name = 'Parque
Central';

NAME
------------------------------------------------
SDO_GEOM.SDO_CENTROID(N.GEOM,M.DIMINFO)(SDO_GTYPE, SDO_SRID, SDO_POINT(X, Y, Z),
--------------------------------------------------------------------------------
-
Parque Central
SDO_GEOMETRY(2001, NULL, SDO_POINT_TYPE(-70.693254, 19.7976302, NULL), NULL,
NUL
```

```
L)

Parque Central
SDO_GEOMETRY(2001, NULL, SDO_POINT_TYPE(-68.966363, 18.4227424, NULL), NULL,
NUL
L)
```

5. What is the total length of each type of road? In other words, what is the total length of all primary roads, secondary roads, tertiary roads, etc. This result represents a summary report of total length of roads by road type.

```
SELECT c.name, SDO_GEOM.SDO_LENGTH(c.geom, m.diminfo)
FROM F12C5980G20.ROADS_MAJOR c, user_sdo_geom_metadata m
WHERE m.table_name = 'ROADS_MAJOR' AND m.column_name = 'GEOM';

2599 rows selected.
```

Spatial Join Queries

1. List all close (within 1 unit distance of each other) pairs of parks and water-features that are named (name is not null). For each pair, provide the osm_id of the park and osm_id of the water feature. The result table would have two columns, namely park osm_id and water osm_id

```
SELECT a1.osm_id as park_osm_id, a2.osm_id as water_osm_id
FROM F12C5980G20.NATURAL a1, F12C5980G20.NATURAL a2, user_sdo_geom_metadata m
WHERE m.table_name = 'NATURAL' AND m.column_name = 'GEOM' AND a1.type = 'park'
AND a2.type = 'water' AND SDO_GEOM.WITHIN_DISTANCE(a1.geom, m.diminfo, 1,
a2.geom, m.diminfo) = 'TRUE';

11988 rows selected.
```

2. In looking at the data, we realize that there are two parks named 'Parque Central' in the natural table. Return a geometry that is the union of the geometries of each of these parks. (Hint: SDO_GEOM.SDO_UNION)

```
SELECT SDO_GEOM.SDO_UNION(a1.geom, m.diminfo, a2.geom, m.diminfo)
FROM F12C5980G20.NATURAL a1, F12C5980G20.NATURAL a2, user_sdo_geom_metadata m
WHERE m.table_name = 'NATURAL' and m.column_name = 'GEOM' and a1.name =
'Parque Central' and a2.name = 'Parque Central';
```

```
SDO_GEOM.SDO_UNION(A1.GEOM,M.DIMINFO,A2.GEOM,M.DIMINFO)(SDO_GTYPE, SDO_SRID, SDO
--------------------------------------------------------------------------------
SDO_GEOMETRY(2003, NULL, NULL, SDO_ELEM_INFO_ARRAY(1, 1003, 1), SDO_ORDINATE_ARR
AY(-70.693371, 19.7979694, -70.693629, 19.7975172, -70.6932, 19.7972426, -70.692
865, 19.7977837, -70.692985, 19.7978483, -70.693371, 19.7979694))

SDO_GEOMETRY(2007, NULL, NULL, SDO_ELEM_INFO_ARRAY(1, 1003, 1, 13, 1003, 1), SDO
_ORDINATE_ARRAY(-70.692865, 19.7977837, -70.692985, 19.7978483, -70.693371, 19.7
979694, -70.693629, 19.7975172, -70.6932, 19.7972426, -70.692865, 19.7977837, -6
8.966625, 18.4232751, -68.966865, 18.4230063, -68.966873, 18.4224689, -68.966599
, 18.4222083, -68.966135, 18.4222002, -68.965861, 18.4224445, -68.965869, 18.423
0389, -68.966092, 18.4232751, -68.966625, 18.4232751))


SDO_GEOM.SDO_UNION(A1.GEOM,M.DIMINFO,A2.GEOM,M.DIMINFO)(SDO_GTYPE, SDO_SRID, SDO
--------------------------------------------------------------------------------
SDO_GEOMETRY(2007, NULL, NULL, SDO_ELEM_INFO_ARRAY(1, 1003, 1, 19, 1003, 1), SDO
_ORDINATE_ARRAY(-68.966625, 18.4232751, -68.966865, 18.4230063, -68.966873, 18.4
224689, -68.966599, 18.4222083, -68.966135, 18.4222002, -68.965861, 18.4224445,
-68.965869, 18.4230389, -68.966092, 18.4232751, -68.966625, 18.4232751, -70.6928
65, 19.7977837, -70.692985, 19.7978483, -70.693371, 19.7979694, -70.693629, 19.7
975172, -70.6932, 19.7972426, -70.692865, 19.7977837))

SDO_GEOMETRY(2003, NULL, NULL, SDO_ELEM_INFO_ARRAY(1, 1003, 1), SDO_ORDINATE_ARR
AY(-68.966865, 18.4230063, -68.966873, 18.4224689, -68.966599, 18.4222083, -68.9
66135, 18.4222002, -68.965861, 18.4224445, -68.965869, 18.4230389, -68.966092, 1
8.4232751, -68.966625, 18.4232751, -68.966865, 18.4230063))

SDO_GEOM.SDO_UNION(A1.GEOM,M.DIMINFO,A2.GEOM,M.DIMINFO)(SDO_GTYPE, SDO_SRID, SDO
--------------------------------------------------------------------------------
```

3. For each named park (name is not null), list the closeby (within 1 unit distance) verified activities (verified = 'YES'). The result table would have two columns, namely park osm_id and activity id. Limit your results to parks with at least 10 nearby activities.(Hint: SDO_GEOM.WITHIN_DISTANCE)

```
SELECT a1.osm_id as park_osm_id,  a2.id  as activity_id
FROM F12C5980G20.NATURAL a1,  F12C5980G20.ACTIVITIES a2,  user_sdo_geom_metadata m
WHERE m.table_name = 'NATURAL' AND m.column_name = 'GEOM' AND a1.type = 'park'  and
a2.verified = 'YES' and  SDO_GEOM.WITHIN_DISTANCE(a1.geom, m.diminfo, 1, a2.geom,
m.diminfo) = 'TRUE';

5708 rows selected.
```

4. *Extra Credit:* What is the name of the longest road in the roads_major table? (Hint: SDO_GEOM.SDO_LENGTH)

```
SELECT c.name,  SDO_GEOM.SDO_LENGTH(c.geom, m.diminfo)
FROM F12C5980G20.ROADS_MAJOR c,  user_sdo_geom_metadata m where  m.table_name =
'ROADS_MAJOR' and m.column_name = 'GEOM' and  SDO_GEOM.SDO_LENGTH(c.geom,
m.diminfo) =( SELECT max(SDO_GEOM.SDO_LENGTH(c.geom, m.diminfo))
              FROM F12C5980G20.ROADS_MAJOR c,  user_sdo_geom_metadata m
              WHERE m.table_name = 'ROADS_MAJOR' and m.column_name = 'GEOM');
```

```
------------------------------------------------
SDO_GEOM.SDO_LENGTH(C.GEOM,M.DIMINFO)
-------------------------------------
cruce de rincon
                           1.07246478
```