SPATIAL DATA IN ORACLE

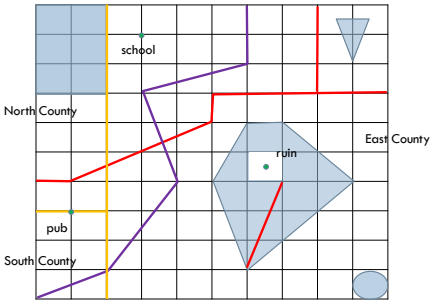
Last Homework

- Student Database: recursive closure of prereqs
- Stops reachable from Howard by brown or red line
- Function: stations one stop away
- Closest station

Todays Homework

- smallest number of train changes
- optimal route given details of runs
- Island extra credit

my_world



Alternative: SDO_RELATE

- SDO_RELATE(<loc>, <loc>, 'MASK = ? ') = 'TRUE'
  - ? can be any of the topological relationships: inside, contains, …
  - ? can also be several topological relationships separated by +, e.g. 'MASK = inside+touch'

Exercise: write query for finding all lakes in a county (even if they share boundary)

Operations on Geometries

- SDO_GEOM.SDO_INTERSECTION(A,B, <tol>)
- SDO_GEOM.SDO_UNION(A,B , <tol>)
- SDO_GEOM.SDO_DIFFERENCE(A,B , <tol>)
- SDO_GEOM.SDO_XOR(A,B , <tol>)
  (symmetric difference: A-B ∪ B-A)

Spatial Joins

- List all pois within 2 miles of a lake
- Can use sdo_within_distance
  - Will use spatial index for only one of the two tables
  - To use both spatial indexes, use sdo_join
- SDO_JOIN(<t1>, <col1>, <t2>, <col2> [, <param>]
  - Param: mask = '?' or distance = '?'
    - Without parameter: SDO_FILTER
  - Returns a set of row ids (type SDO_ROWIDSET)
  - Use TABLE constructor: TABLE (SDO_JOIN(…)) to use in query

Closest Points

- SDO_CLOSEST_POINTS(<geo1>, <geo2>, <tol>, <param>, **<dist>**, **<pt1>**, **<pt2>**)
- geo: input geometries, tol: tolerance
- dist: output distance, pt1, pt2: points resulting in distance

Examples:

- find the closest points in rectangle and poly lake and their distance
- for each street and lake, find the closest points and list them with distance

RELATE

- sdo_geom.relate(<geo1>, <param>, <geo2>, <tolD>)
  - 'mask=determine': determine relationship between geometries
  - or 'mask=disjoint', … returns 'TRUE' or 'FALSE'

Example: determine all relationships between lakes and counties.

Functions on Geometries

- sdo_geom.sdo_area(<geom>, <tol> [, <param>])
  - area of a region
  - can specify units: `unit = sq_yard' or 'unit = sq_mile', etc.
  - Example: find areas of all lakes
- sdo_geom.sdo_length(<geom>, <tol> [, <param>])
  - length of a curve
  - Example: find the length of all streets
- sdo_geom.sdo_volume
- sdo_geom.sdo_mbr
  - returns MBR

Convex Hull

- SDO_GEOM.SDO_CONVEXHULL(<geo>, <tol>)
  - Computes convex hull
  - Returns SDO_GEOMETRY

Example: test which lakes are convex. Problem?

Other

- SDO_POINTONSURFACE
  - returns point on surface
- SDO_CENTROID
  - returns centroid (center of gravity) of geometry
- SDO_AGGR_UNION
  - takes union of family of objects

Exercises

- calculate how many miles of the red street lie in North county
- what's the total area of islands
- which counties would a straight road between the pub and the school pass through?
- what is the shortest swim from the island to the shore of poly lake?
- south county has money to build a road connecting the pub to purple street, what's the resulting street? (Assume that south county does not want to invest in building projects in other counties.)
- write a function to check whether you have to cross a given road to get from one point of interest to another