GIS data models and representation I: worksheet

1. Similar to the slides, pick a small TIN with 4 or 5 vertices and draw the edge-based and triangle-based representations for it.

2. Assume an edge-based representation of a TIN. Discuss how you would do each of these operations:

    a. walk along an edge path

    b. walk from triangle to triangle

    c. given ad edge, find its adjacent faces

    d. Walk along the boundary of a face

    e. find all edges and triangles incident to a point

3. Assume a triangle-based representation of a TIN. Discuss how you would do each of these operations:

    a. walk along an edge path

    b. walk from triangle to triangle

    c. given ad edge, find its adjacent faces

    d. Walk along the boundary of a face

    e. find all edges and triangles incident to a point

4.   How much memory would one need in order to store an edge-based topological representation for a TIN of n points. Assume a point stores (x,y,z) and coordinates are floats (a float is 4B). A pointer takes 8B. Express the amount of memory function of n, e and f, where e is the number of edges in the TIN and f is the number of faces (triangles) in the TIN.

5. Same as 2, but for triangle-based representation.

6. Assume we have a TIN with n points. How many edges are in the TIN?

7. Assume we have a TIN with n points. How many faces are in the TIN?

8. Solve again problem 3 and 4, but this time as function of n only.

9. Based on 6 and 7 above, which representation is more space efficient? Can you think of some advantages that the other representation might have?

10. Assume we have a grid of 300km by 300km at 1m resolution. How much space does it use, in GB?

11. Assume the grid undergoes a process of simplification where 90% of the grid points are eliminated, leaving 10% of the grid points to be represented as a TIN. How much space does the TIN need? How much space is saved, compared to the grid?