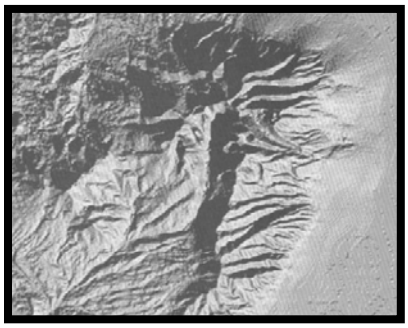
Statistical Surfaces

- Simply put:
  - Statistical Surface: A technical phrase for representation of elevation (*z*) data in GIS
- The *z* value is THE measure for the magnitude (or Volume) of the features – hence the term "*statistical*"

Surface Types

- Continuous
  - Example: A hilly area
- Discrete
  - Example: An arena seating
- Smooth surface
  - Little or no change in statistical information within unit distance
- Rough surface
  - Major change in statistical data with small change in distance

How would you do this in GIS?



- Problem with Continuous surface:
  - Infinite number of points for measurement
  - Next to impossible to measure
  - Even if you have methods to measure, no computer can handle it
- Solution
  - Sampling, and
  - Modeling

Surface Mapping

- Some means:
  - Discrete data
    - Dot mapping
    - Choroplethic mapping
    - Dasymetric mapping
  - Continuous Data
    - Isarithmic mapping (most common method)
      - Example: contour diagram
      - *Contour Interval*: Uniform intervals of elevation difference
      - Closer the contours, steeper the surface

Sampling

- Two major ways:
  1. Isometric – selected *point* "values" (interval data)
     - Commonly applied for contour lines
     - Also used for maps of barometric pressure, temperature etc.
       - Recall the weather maps on TV
  2. Isoplethic - aggregated values over a small *area* feature
     - Valued applied to the *centroid*
     - Draw contours as in Isometric

Isoplethic Mapping

- Data collection point is chosen from within the each area
  - Where in the area will you sample?
    - Regular grid or regular lattice
      - Uniform sampling across the area
    - Irregular lattice
      - Sampling based on prior knowledge
  - What do you do with the sampled data?
    - Define and compute a representative measure (like an average!)
    - Plot the contours

The DEMs

- TIN model:
  - One of a number of methods of storing *z*-value information
  - The basic vector data structure of representing surfaces in the computer
- Digital Elevation Model – DEM
  - A group of products
  - Based on the TIN model
- Digital Terrain Models
  - DEMs + Images

The DEMs - 2

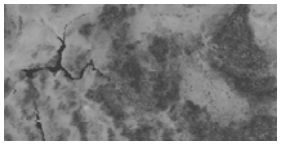
- Available for many parts of the world
  - 63.5 m grids obtained from 1:250,000 topographic maps
  - Also available in larger scale maps

Discrete Altitude Matrix

- DAM:
  - A point image method
  - Represents the surface by number of points – each containing a single elevation value

Shaded Terrain Models

Satellite Image (Multispectral)



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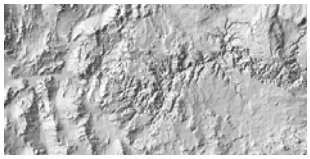
Digital El. Model (TIN + shaded)



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Digital Terrain Model