Data Capture

A. Encoding Procedures

1. Digitization

2. Standardization

3. Geocoding

4. Spatial data structure

B. Digitization

"Conversion of geographic information into a form compatible with the computer."

1. **Graphical / geometric (geographic) vs. numerical (computer)**
2. **Data source**
   a. **textual or tabular information**
   b. **map or image**
3. **Image conversion to coordinates**
   a. **Arbitrary hardware coordinates**
   b. **Document coordinates**
   c. **Standardized coordinates**

Data Capture

4. Methods of digitizing
   a. Measurement
   b. Graph paper
   c. Interpolation

4. Methods of digitizing (continued)
   d. Coordinatograph (digitizer)
      1) Electromechanical
         a) Inverse of incremental plotter
         b) Origin
      2) Magnetic / electrical pulse
         a) Wire grid
      3) Acoustic
      4) Continuous (stream digitizing)
         a) Spatial incremental
         b) Time incremental
      5) Automated line following

4. Methods of digitizing (continued)
   e. Raster scanners
      1) Resolution
      2) Pixel depth / colors
      3) Scan conversion (raster-to-vector)
   f. Digitizing from scanned information
      1) Positioning
      2) Visibility / reliability due to image and digitized linework on screen simultaneously.
      3) Conversion into standardized coordinates.

C. Standardization

"Transformation of coordinates into standardized system of spatial reference."

1. **Function: provide information in a large geographic context.**
2. **Types of coordinate systems**
   a. **Latitude / longitude**
   b. **Universal Transverse Mercator**
   c. **State Plane Coordinates**

D. Geocoding

"Logical specification of the spatial relationships between geographic data elements."

1. Primitives

"Unit of digitization and coding."

a. Types

1) Point

2) Line segment

b. Attributes

1) Location

2) Value

3) Size or extent

4) Relationships to other elements

2. Compounds

"Higher level unigs made up of geographic primitives and their relationships."

a. Types

1) Nodes (points)

2) Chains (lines)

3) Areas

4) Surfaces / Volumes

3. Relationships

a. Connection / separation

b. Adjacency / neighborliness

c. Concatenation

4) Inclusion / exclusion

E. Spatial data structures

Create spatial data structures appropriate for the data and the problem

F. Characteristics of geographic data

1. Location
2. Data volume (large amounts)
3. Dimensionality
   a. point
   b. line
   c. area
   d. surface / volumetric

Data Capture

4. Level of measurement
   a. nominal
   b. ordinal
   c. interval
   d. ratio
5. Continuity / discontinuity

G. Properties of geographic phenomena
   1. Size and measurability
   2. Length
   3. Direction / orientation
   4. Connectivity
   5. Distribution
      a. Pattern
   6. Nearness
   7. Adjacency

H. Geocoding goals

1. Minimize costs, esp. labor
2. Detect / eliminate errors
3. Optimize storage
4. Maximize flexibility

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I. Level of detail
   1. Critical points
   2. Curvature
   3. Digitizing modes
      a. Point
      b. Stream
         1) Spatial incremental
         2) Time incremental
   4. Balance
      a. Detail
      b. Storage requirements
      c. Application

J. Topology and Data Capture

1. Topology

"branch of mathematics dealing with the relationships among geometric entities"

a. Relationships (examples)

1) Connectivity

2) Adjacency

b. Graphs

"Simplified representation of topological relationships"

1) components
   a) nodes
   b) edges
2) example applications
   a) networks
      1) Airline route diagrams
      2) Driving distance diagrams

4) Dual
   a) Subgraphs
      1) enclose regions
   b) Edges
      1) edges connect nodes
      2) edges “separate” regions
      3) edges also “connect” regions
   c) A graphs can be “inverted”
      1) “regions” become “nodes”
      2) “edges” remain “edges”
         a) but connect the new “nodes” (formerly “regions”)
      3) “nodes” become “regions”

2. Application in data capture
   a. Digitization
      1) Boundaries
         a) Digitize boundaries only once
         b) Use for adjacent regions