GIS Data Processing

Chap 2

Type of Processing

• Data Acquisition/ Assembly.
• Data Process and Analysis.
• Data Storage.
• Data Output.
Data Acquisition

- Direct capture of data by electronic imaging
- Remote (satellite imagery)
- Camera
- Import digital data of different formats

Data Input Creation
Data Process and Analysis

- Automated mapping
- Map overlay

• Schemas/Layers definitions

Spatial Analysis

Overlay function creates new “layers” to solve spatial problems
Spatial Data Output

- Tables
- Maps
- Interactive Displays
- 3-D Perspective View

Spatial Analysis/Queries

- Geometrical Operations: surface, perimeter, etc
- Topological Operations: Neighborhood, adjacent, distance, shortest, closest, between, inside, intersect, etc
- Directional Operations: N, NE, etc
Storage

How to store and access spatial data?
Spatial data is mainly of two types: raster and vector

Raster Oriented (Raw data)

1-Grid: Matrix based

Grid and KD-tree

[Diagram illustrating grid and KD-tree structures]
**Storage**

1. **(Universe polygon)**

   ![Spatial data](ARC functions)

2. **Attribute data**

   (INFO or TABLES functions)

<table>
<thead>
<tr>
<th>COV#</th>
<th>ZONE</th>
<th>ZIP</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td></td>
<td>0</td>
</tr>
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<td>2</td>
<td>C-19</td>
<td>22060</td>
</tr>
<tr>
<td>3</td>
<td>A-4</td>
<td>22051</td>
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<td>22060</td>
</tr>
<tr>
<td>5</td>
<td>A-5</td>
<td>22057</td>
</tr>
</tbody>
</table>

3. **2-Hierarchies: tree based (Quadtree)**

   ```
   {0010, val), (001111, val),
   1000, 1101, 1110,
   1101, 1111}
   ```
Region Quadtree

Storage
Vector-Oriented (data with semantic information)

- Quadtree based (PM Quadtree)
  - At most, one polygon vertex can lie in a region represented by a quadtree leaf node
  - If a quadtree leaf node region contains a vertex, then any edge of this region must contain that vertex
  - If a quadtree leaf node region does not contain vertices, it can contain at most one edge
Storage
• Example

Data Storage
• Rtree based
Common geographic themes

- Land use
- Streets
- Buildings
- Networks/Graphs (Roads, pipes, etc)
- Hydrology
- Topography