Brief Overview of Geographic Information Systems (GIS) Technology

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Presenter

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What is GIS?

Geographic Information Systems (GIS) is a technology and set of methods used to create, manage, analyze, and distribute spatial information.
Strengths of GIS

- Integrates data by location regardless of format
- Visualizes information, most often in the form of a map
- Allows analysis of spatial data and associated attributes
Spatial Data

Spatial data, stored in both raster and vector formats, identifies a location.

Vector Data
- Stores the x,y coordinates that represent the locations / boundaries of map features.
- Polygon
- Line
- Point

Raster Data
- Represents the dominant feature that is present in a cell.

- Flooded
- Dry

Cells
Spatial Attribute Data

- Information associated with a location
- Examples
  - Street name, type, speed limit, etc.
  - Person name, age, gender, education, etc.
  - Utility owner, use, right of way, etc.
  - Date of origin, size, access rights, etc.
Layering

Spatial data and its attributes are organized as overlying “layers” that can be viewed and analyzed in any combination.
“Smart” Map

GIS links the visual map to a database of locations and attributes, thus making the map dynamic or capable of supporting queries. This association forms the analytical power of GIS.
"Smart" Map

The map represents information (attributes) in the database
“Smart” Map

The database and map are linked by a unique value or common identifier.
GIS handles multiple data types

- Tabular data
- Satellite or aerial photography
- GPS coordinates
- Text
- Multimedia
Spatial Analysis

GIS supports analysis in multiple forms and at multiple scales

- Proximity analysis
- Network analysis
- Cluster analysis
- Spatio-temporal analysis
- Agent-based modeling
- Spatial interaction modeling
Spatial Analysis

Which parcels owned by the City of Carmel are zoned for industrial development?

**Parcel Layer**

<table>
<thead>
<tr>
<th>ID</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>City of Carmel</td>
</tr>
<tr>
<td>36</td>
<td>School</td>
</tr>
<tr>
<td>37</td>
<td>Kokomo</td>
</tr>
</tbody>
</table>

**Zoning Layer**

<table>
<thead>
<tr>
<th>ID</th>
<th>Soil Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Industry</td>
</tr>
<tr>
<td>2</td>
<td>Comm.</td>
</tr>
<tr>
<td>3</td>
<td>Residential</td>
</tr>
</tbody>
</table>

**Perform Analysis**

<table>
<thead>
<tr>
<th>ID</th>
<th>Zoning</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Industry</td>
<td>City of Carmel</td>
</tr>
<tr>
<td>2</td>
<td>Industry</td>
<td>Indianapolis</td>
</tr>
<tr>
<td>3</td>
<td>Residential</td>
<td>City of Carmel</td>
</tr>
<tr>
<td>4</td>
<td>Comm.</td>
<td>City of Carmel</td>
</tr>
<tr>
<td>5</td>
<td>Residential</td>
<td>Howard Smith</td>
</tr>
<tr>
<td>6</td>
<td>Residential</td>
<td>Mable Marble</td>
</tr>
<tr>
<td>7</td>
<td>Comm.</td>
<td>Mable Marble</td>
</tr>
</tbody>
</table>

**Perform Query**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
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<td>City of Carmel</td>
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</table>
Spatial Analysis

Where are the highest density populations found within the service area of a facility?

Service area overlaid with population density
The Power of Spatial Models

- Explore impact of change within a spatial context
- Examine different spatial scenarios
- Perform cost-benefit analysis within a defined geography
Questions