

Geographic Information System (GIS)



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GIS Analysis Functions



Introduction



- What distinguishes a GIS from other types of information systems are its **spatial analysis functions**.
- These functions use the spatial and non- spatial attribute data in the GIS database to answer questions about the real world.

The answers provided by a GIS



1. A presentation of the current data , i.e. the data in the database such as a map of the city streets.
2. A pattern in the current data, such as all houses valued at over \$100,000.
3. A prediction of what the data could be at a different time or place.

Types of questions to be answered



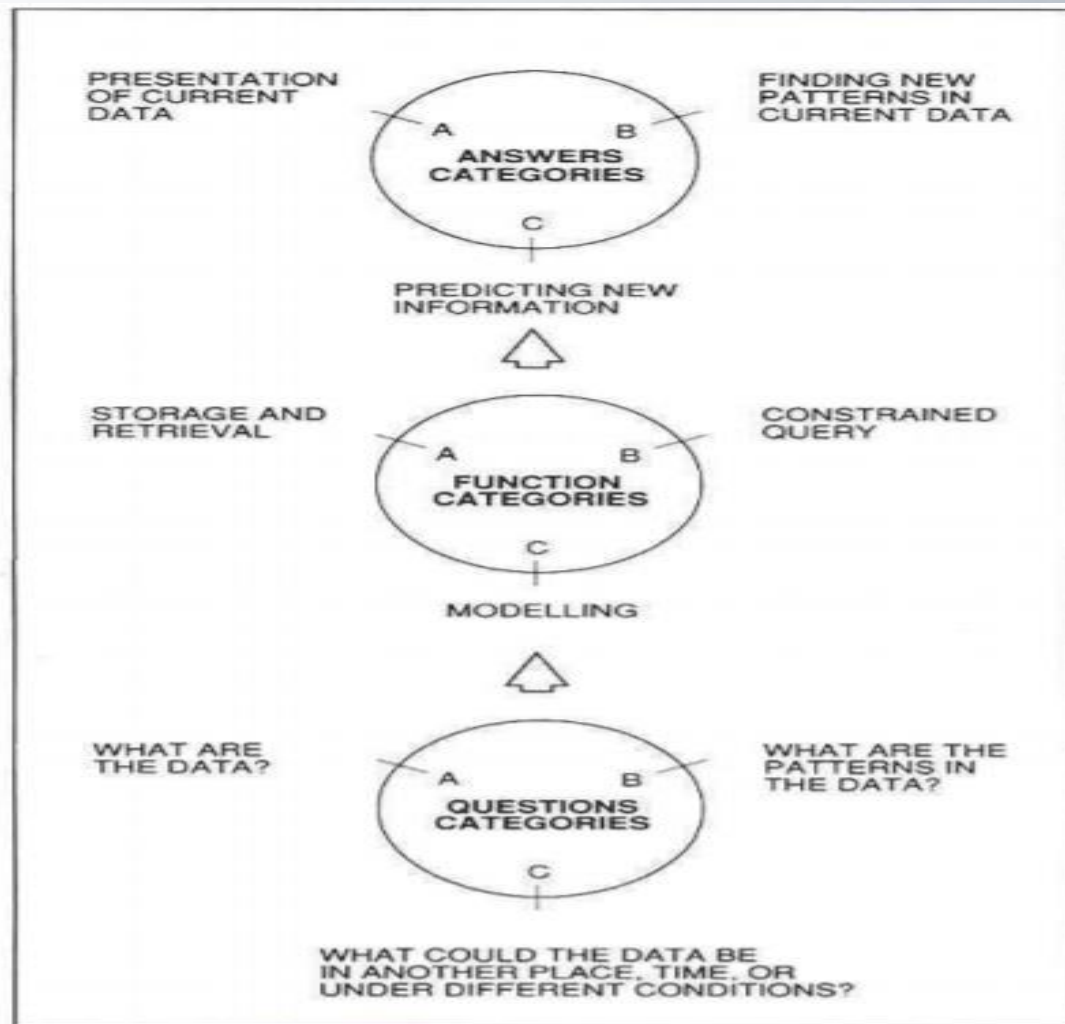
1. What are the data?, i.e. what is the information currently stored in the database.
2. What is the pattern in the data? This type of question is a search for entities that possess a specified set of characteristics.
3. What could the data be in the future? This type of question implies that a predictive model will be used.

Functions used to produce these answers



- Storage and retrieval functions.
- Constrained query functions.
- Modelling functions.

Categorizing Questions, Functions, and Answers in a GIS Analysis



Classification of GIS Analysis Functions



1. Maintenance and analysis of spatial data.
2. Maintenance and analysis of attribute data.
3. Integrated analysis of spatial and attribute data.
4. Output formatting.

1. Maintenance and analysis of spatial data.



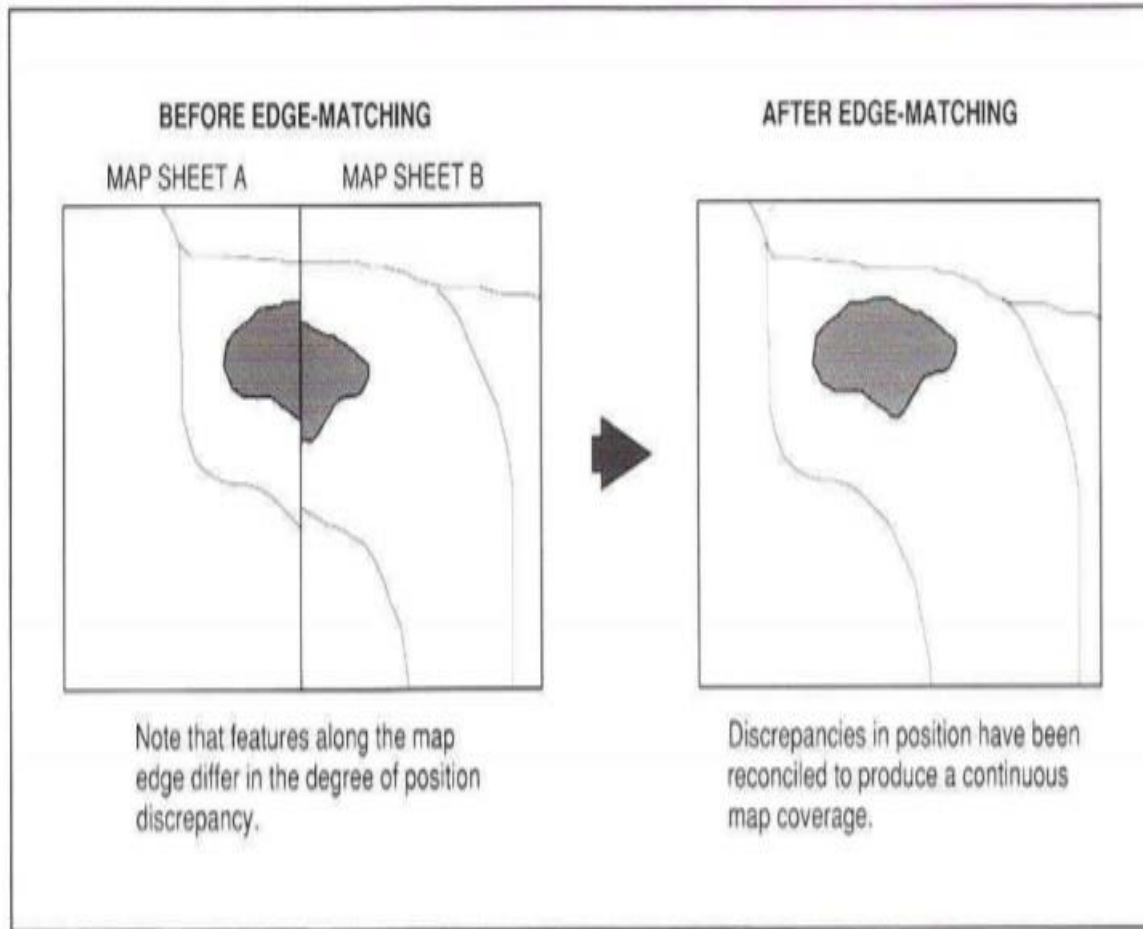
- **Format transformation:** Transforming the data into a suitable format for the GIS (raster or vector).
- **Geometric transformation:** Used to assign coordinates to a map or a data layers so that it can be correctly overlaid on another of the same area. This process is called Registration.
- **Transformation between map projections:** The data layers to be used together for analysis by GIS should be using the same map projection.

Maintenance and analysis of spatial data cont.



- **Conflation**: is the process of reconciling the position of the features in different data layers to overlay precisely.
- **Edge matching**: a procedure to adjust the position of features that extend across map sheet boundaries.

Edge Matching

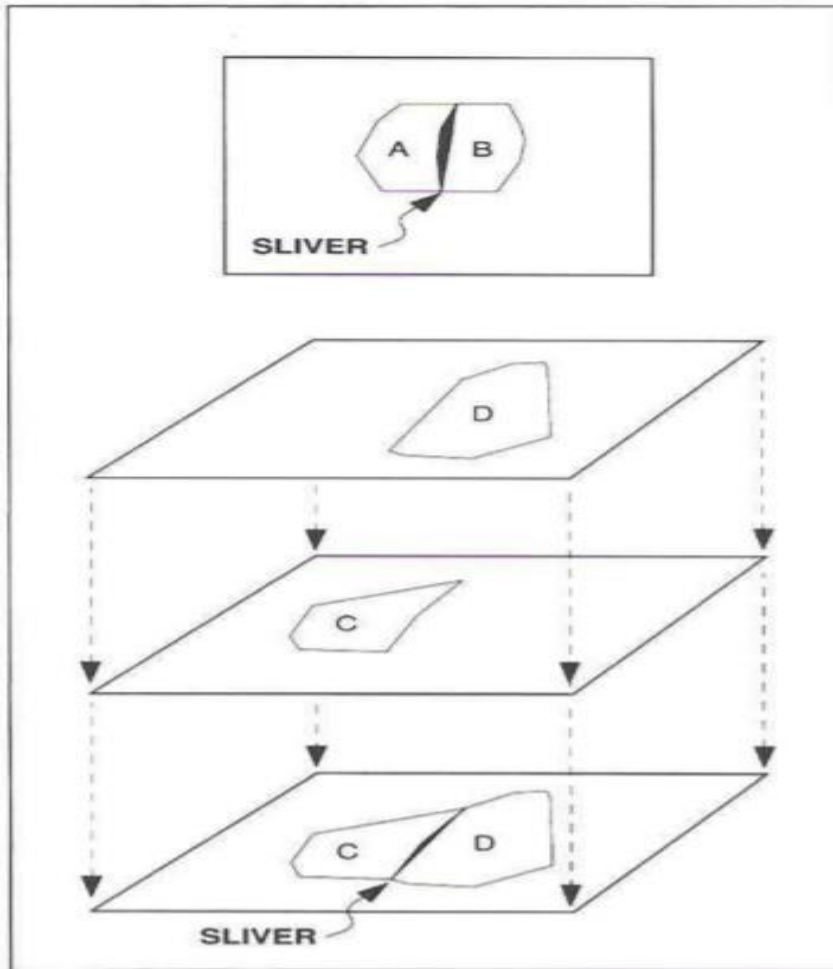


Maintenance and analysis of spatial data cont.



- **Editing Functions:** are used to add, delete and change the geographic position of features.
- **Slivers or splinters** are thin polygons that are often created during digitizing and overlay operations.

Editing Functions

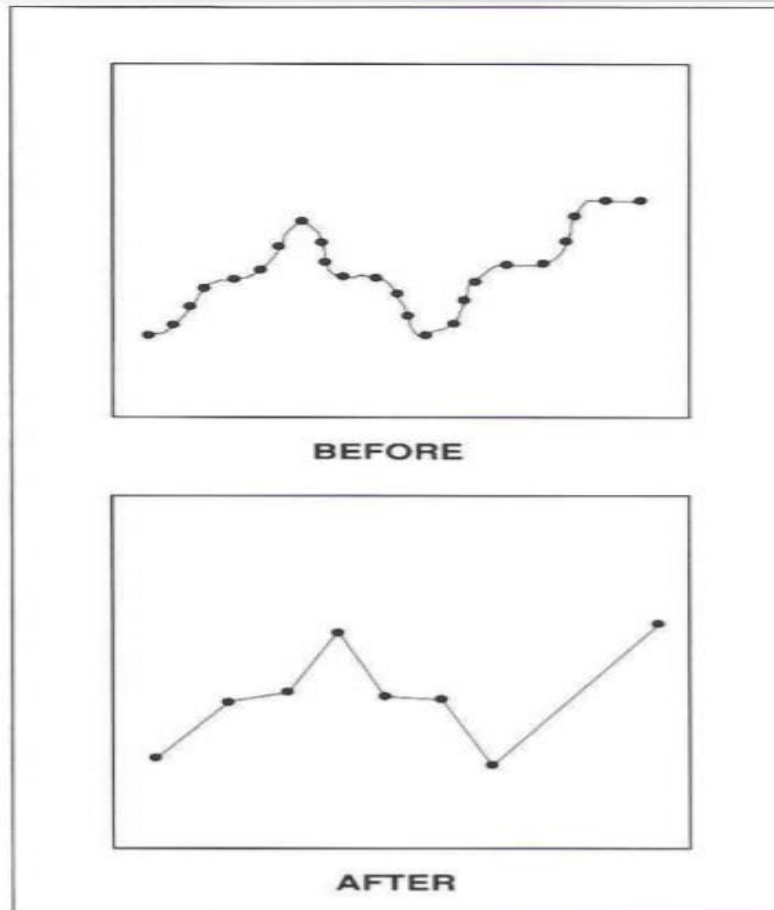


Maintenance and analysis of spatial data cont.



- **Line coordinate thinning**: used to reduce the quantity of coordinate data that must be stored by GIS. The thinning function reviews all the coordinates and removes the un-necessary ones.

Line coordinate thinning



2. Maintenance and analysis of attribute data.



- **Attribute editing functions:** allow the attributes to be retrieved, examined and changed.
- **Attribute query functions:** retrieve records from the database relevant to a query.

3. Integrated analysis of spatial and attribute data.

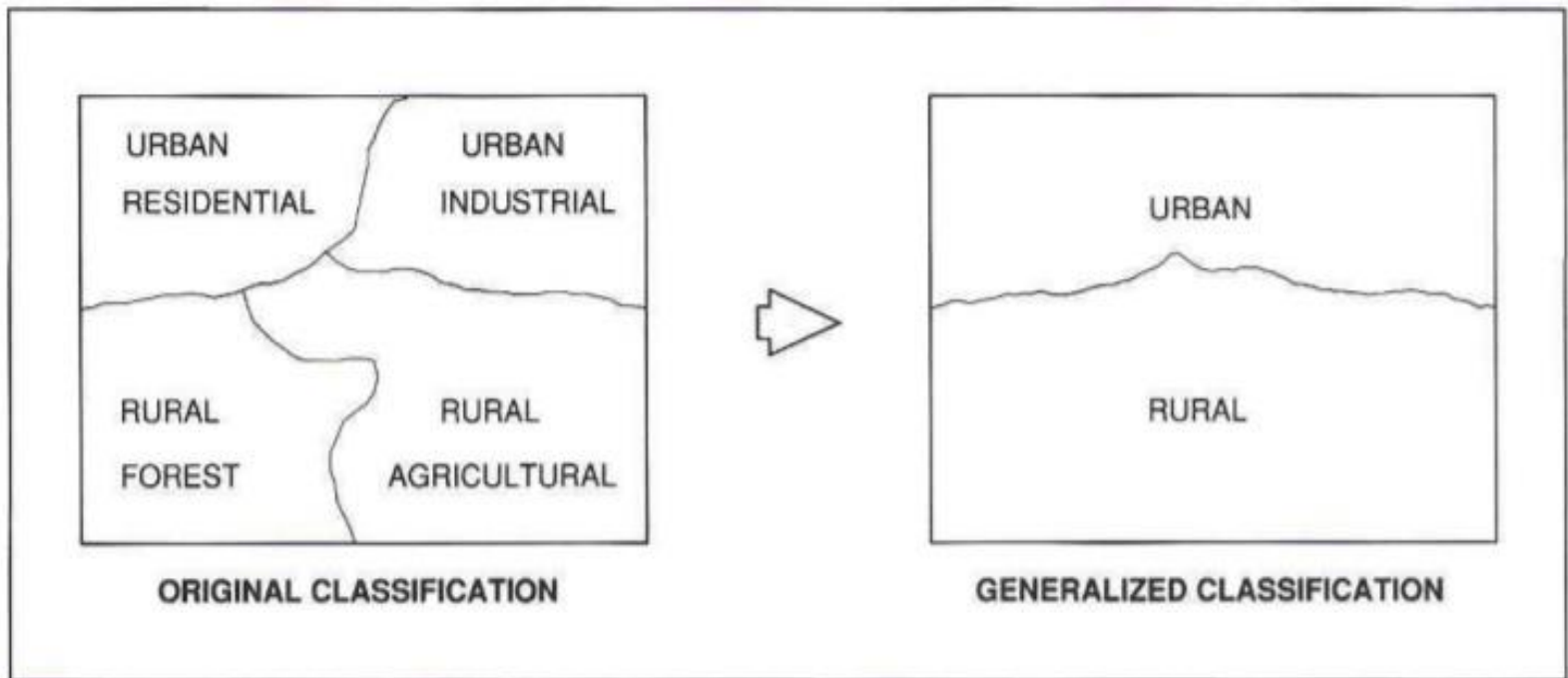


- **Retrieval operations:** involve the search, manipulation and output of the data without modifying the locations of the features.
- **Classification and generalization:**
Classification: the procedure of identifying a set of features as belonging to a group.

Classification & generalization



Generalization: called map dissolve, is the process of making a classification less detailed by combining classes.



3. Integrated analysis of spatial and attribute data cont.



- **Measurement:** Spatial measurements include distance measurement between points, line length, perimeters and areas of polygons.

4. Output formatting (map annotation)



- Map design principles

1. The names should be logical and close to the feature they describe.
2. The association between the name and the object should be easily recognized.
3. Labels should not overlap.
4. The format and positioning of the name labels should reflect its relative importance.

Review



1. Introduction.
2. Classification of GIS analysis functions:-
 - Maintenance and analysis of spatial data.
 - Maintenance and analysis of attribute data.
 - Integrated analysis of spatial and attribute data.
 - Output formatting.



Thank You
Questions ??