Geog 480: Principles of GIS

Models of geospatial information

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General Principles

• Nature of Geographic Data
• Elements of GIS and Relevant GIS Terminology
• GIS Functionality
• Data Modeling
Fundamental Database Concepts

- Database Characteristics
- DBMS Elements
- Metadata
- Database Transaction Support
- Database Models
- Relational Model
- Operations on Relations and Relational Algebra
- Structured Query Language (SQL)
- Entity-relationship model (E-R)
- Extended Entity-Relationship Model
- Object-oriented (O-O) Constructs
- O-O Modeling
Fundamental Spatial Concepts

• Spatial Concepts
• Euclidean Space
• Set-based Geometry of Space
  o Set Characteristics
  o Set Operations
  o Relations of Sets
  o Function Properties
  o Convexity
• Topological Space
  o Neighborhood
  o Usual Topology
  o Near Point
  o Properties of a Topological Space
  o Connectedness
• Network Space
  o Graph
  o Tree
• Metric Space
Models of Geospatial Information

- Ontology
- Morphism
- Types of Models
  - Field-Based Models
    - Field-Based Modeling Method
    - Properties of Attribute Domain
    - Properties of a Spatial Field
    - Spatial Autocorrelation
    - Field Operations
  - Object-based Models
    - Spatial Objects
    - Spatial Operations
    - Set-Oriented Operations
    - Topological Operations
    - 4-Intersection Model
Example Question 1

- Is the UTM (Universal Transverse Mercator) projection a surjection function? Why or why not?
What does encapsulation do in object-oriented modeling and why is it used? Please give an example of applying encapsulation.
Example Question 3

• Consider a relation R(A, B) that has cardinality r (contains r tuples), and a relation S(A, B) that has cardinality s (contains s tuples). Assume r > 0 and s > 0 and make no assumptions about keys. For the following relational algebra expression, state in terms of r and s the minimum and maximum cardinality (number of tuples) that could be in the result of the expression.

  o R U S
• End of this topic