

# Topology



- ▶ Digitization errors :overshoot and undershoot
- ▶ Entity error – (position error), primarily associated with vector model (missing entities, incorrectly placed entities, disordered entities)
- ▶ Attribute error ( occurs in both vector and raster models, typing errors, misspelling, etc. )

- ▶ Topology is a procedure for explicitly defining spatial relationships connecting adjacent features (e.g., arcs, nodes, polygons, and points).
- ▶ Different types of spatial relationships are expressed as lists of features e.g.
- ▶ An area is defined by the arcs comprising its border
- ▶ An arc is defined by set of points (X,Y)



- ▶ The three major topological concepts are:
- ▶ Connectivity: Arcs connected to each other at nodes
- ▶ Contiguity/Adjacency: Arcs have direction and left and right sides
- ▶ Area Definition: Arcs connected to surround an area define a polygon (area)



- ▶ Check for digitization errors (overshoot, undershoot, unclosed polygon, missing labels, too many labels)
- ▶ Store data more efficiently (eliminate data redundancy-normalization)
- ▶ Make spatial analysis more faster

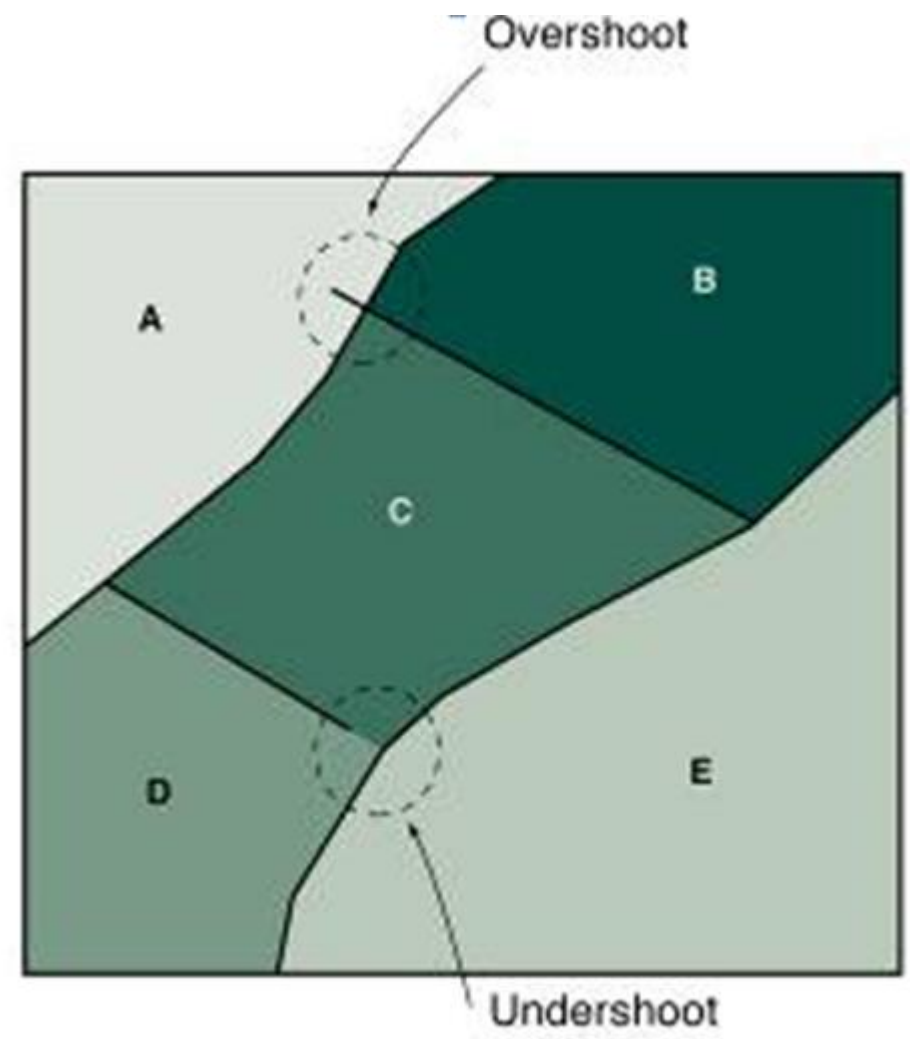
- ▶ Continuous data: objects which have no definite boundary, generally no "empty" space and assumed to have three dimensions X,Y and Z e.g. elevation, temperature, and rainfall. The data is represented as surface in GIS
- ▶ Discrete data: objects which occupy a specific location in space at a given point in time e.g. road, river, and represented as point, line, or area feature in a GIS



- ▶ Typology of human errors in digitizing:
  - (A) undershoots and overshoots;
  - (B) invalid polygons;
  - (C) sliver polygons

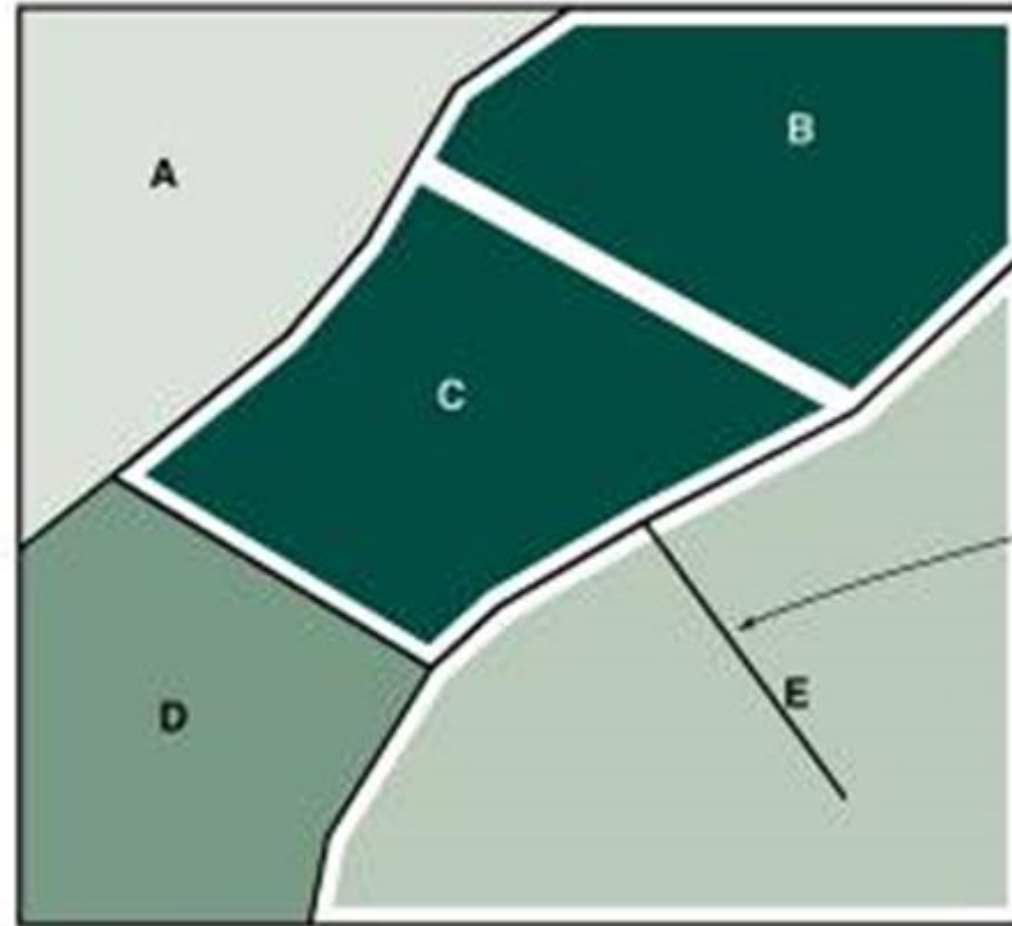


# (A) undershoots and overshoots



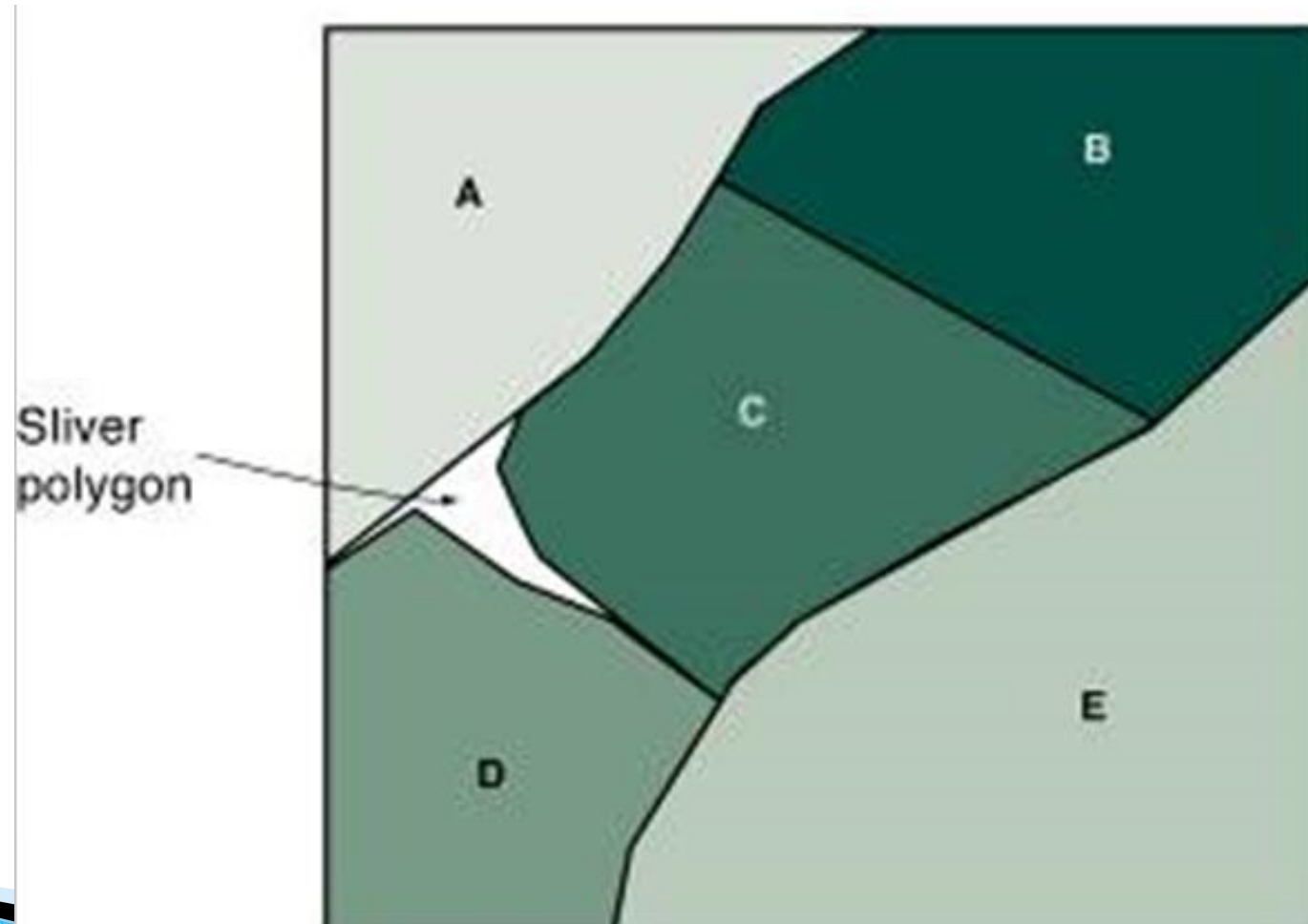


# (B) invalid polygons

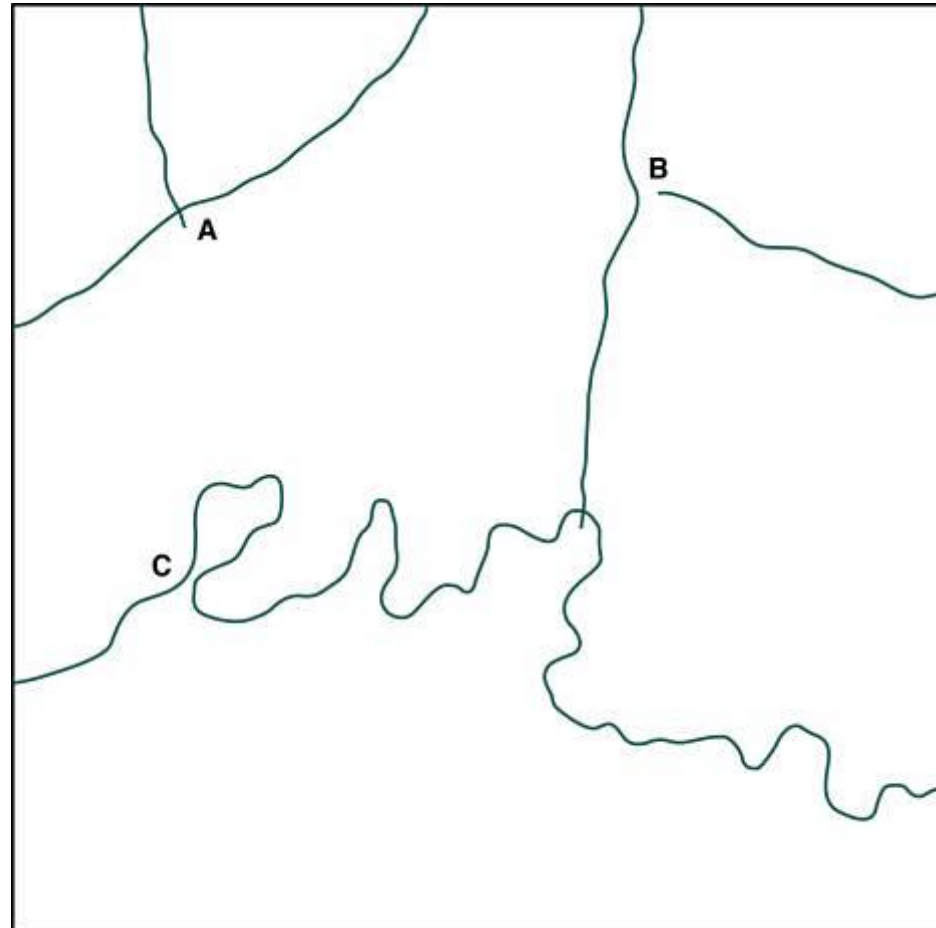


Dangling  
segment

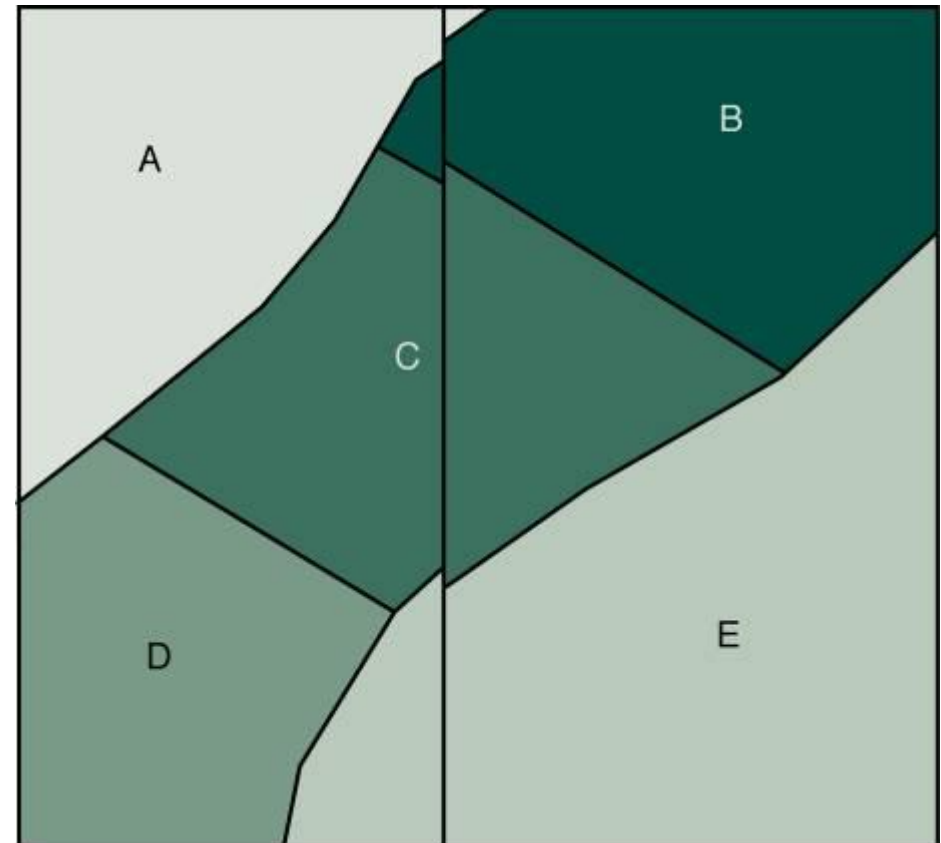
# (C) sliver polygons



# Error induced by data cleaning



- ▶ Mismatches of adjacent spatial data sources that require rubber-sheeting



Non-Topologic	Topologic
Display quickly	Display more slowly
Simple and compact data storage	More complicated and less compact data storage
Difficult to find and fix errors	Can clean up maps easily.
Spatial queries more difficult	Facilitates advance spatial queries.
**	Can easily develop measurements along routes
Method of choice when need a simple map	Method of choice when need smart map