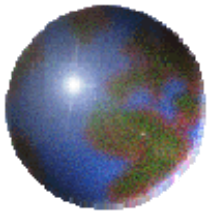

9. GIS Data Collection

Geographic Information Systems and Science

SECOND EDITION

Paul A. Longley, Michael F. Goodchild, David J. Maguire, David W. Rhind

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Overview

- Introduction
- Primary data capture
- Secondary data capture
- Data transfer
- Capturing attribute data
- Managing a data capture project

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Data Collection

- One of most expensive GIS activities
- Many diverse sources
- Two broad types of collection
  - Data capture (direct collection)
  - Data transfer
- Two broad capture methods
  - Primary (direct measurement)
  - Secondary (indirect derivation)

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Data Collection Techniques

	Raster	Vector
Primary	Digital remote sensing images	GPS measurements
	Digital aerial photographs	Survey measurements
Secondary	Scanned maps	Topographic surveys
	DEMs from maps	Toponymy data sets from atlases

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Client-server GIS Costs

	10 Seats		100 Seats	
	$	%	$	%
Hardware	30	3.4	250	8.6
Software	25	2.8	200	6.9
Data	400	44.7	450	15.5
Staff	440	49.1	2000	69.0
Total	895	100	2900	100

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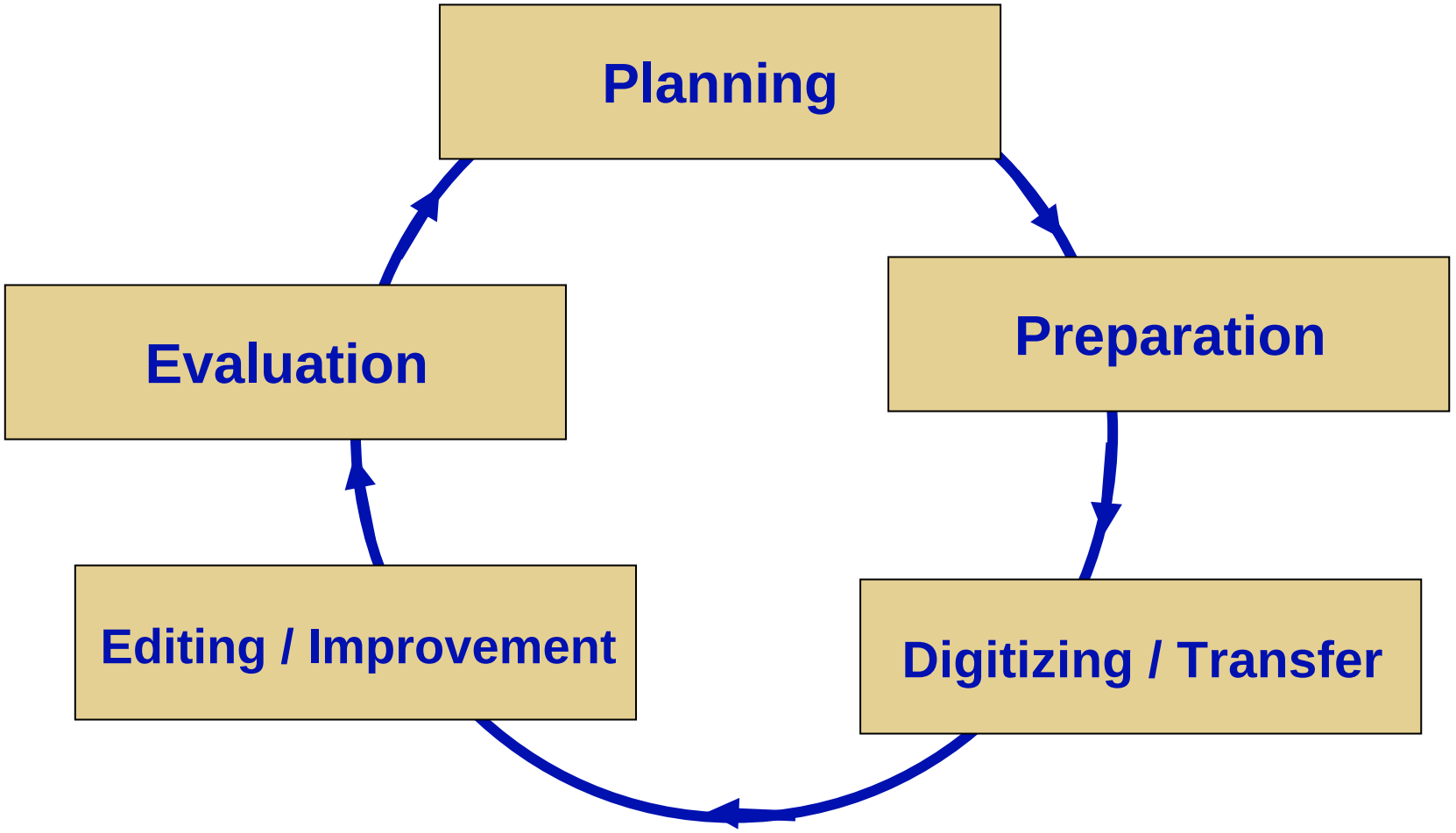
Stages in Data Collection Projects



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Primary Data Capture

- Capture specifically for GIS use
- Raster – remote sensing
  - e.g. SPOT and IKONOS satellites and aerial photography
  - Passive and active sensors
- Resolution is key consideration
  - Spatial
  - Spectral
  - Temporal

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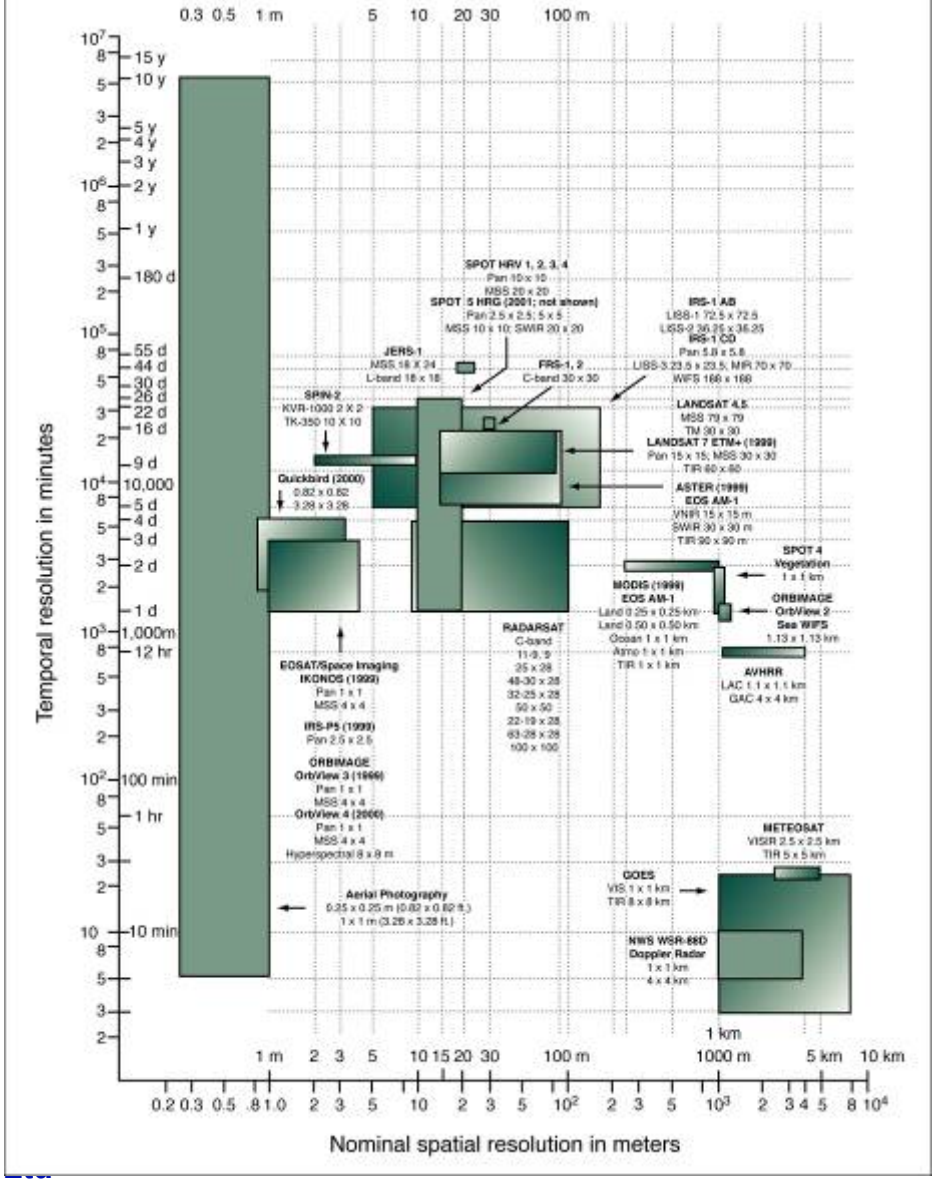

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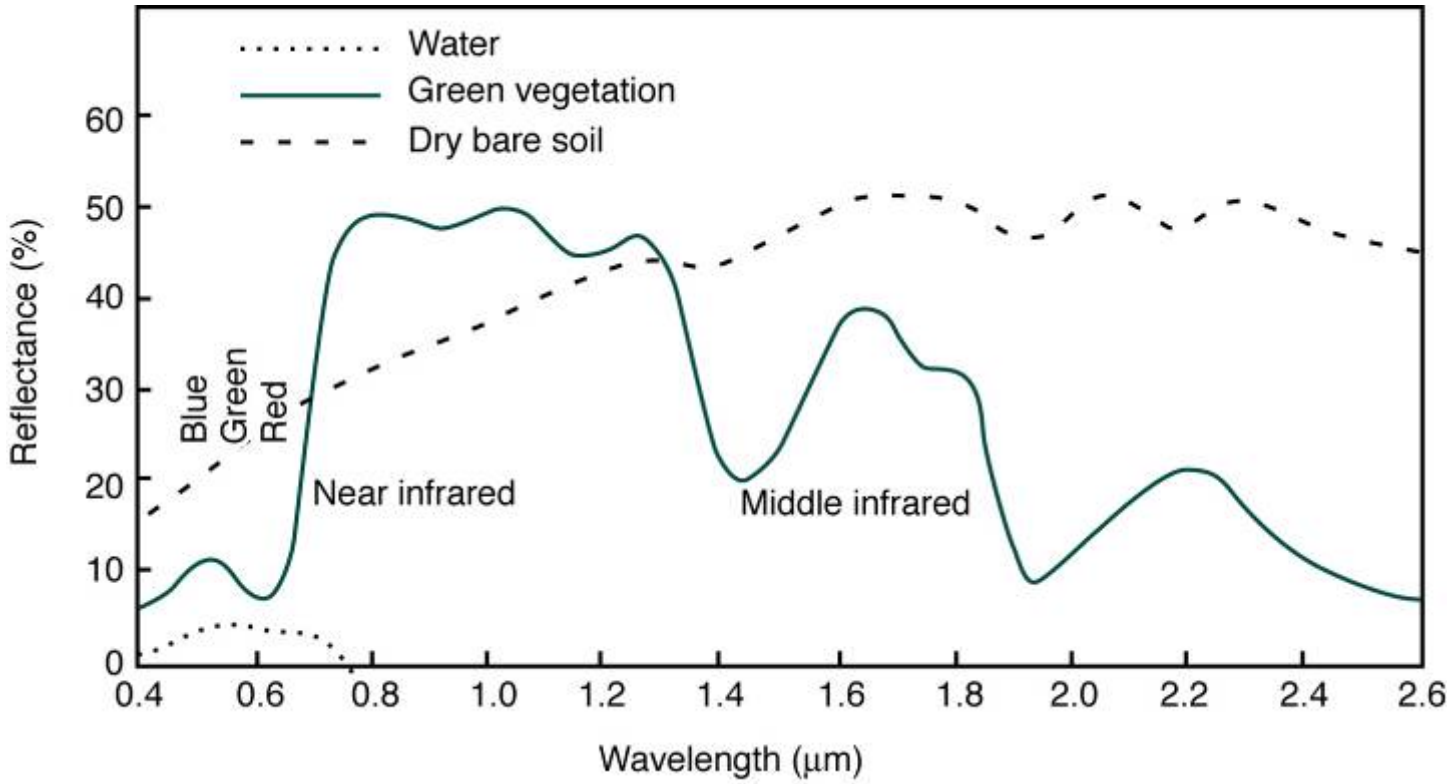
Typical Reflectance Signatures



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Vector Primary Data Capture

- Surveying
  - Locations of objects determines by angle and distance measurements from known locations
  - Uses expensive field equipment and crews
  - Most accurate method for large scale, small areas
- GPS
  - Collection of satellites used to fix locations on Earth's surface
  - Differential GPS used to improve accuracy

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Total Station

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Secondary Geographic Data Capture

- Data collected for other purposes can be converted for use in GIS
- Raster conversion
  - Scanning of maps, aerial photographs, documents, etc
  - Important scanning parameters are spatial and spectral (bit depth) resolution

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Vector Secondary Data Capture

- Collection of vector objects from maps, photographs, plans, etc.
- Digitizing
  - Manual (table)
  - Heads-up and vectorization
- Photogrammetry – the science and technology of making measurements from photographs, etc.
- COGO – Coordinate Geometry

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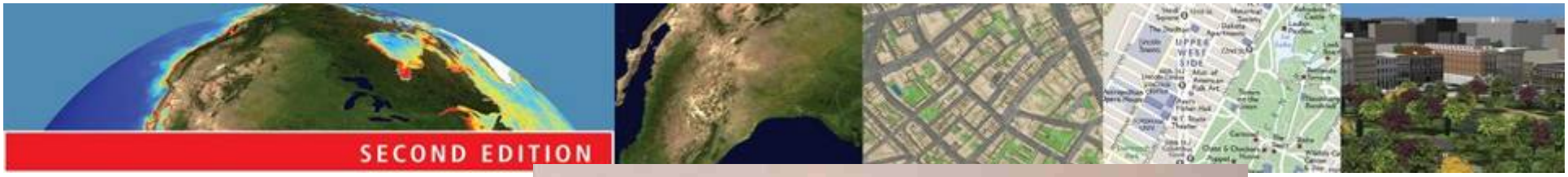

Scanner

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Vector Over Raster

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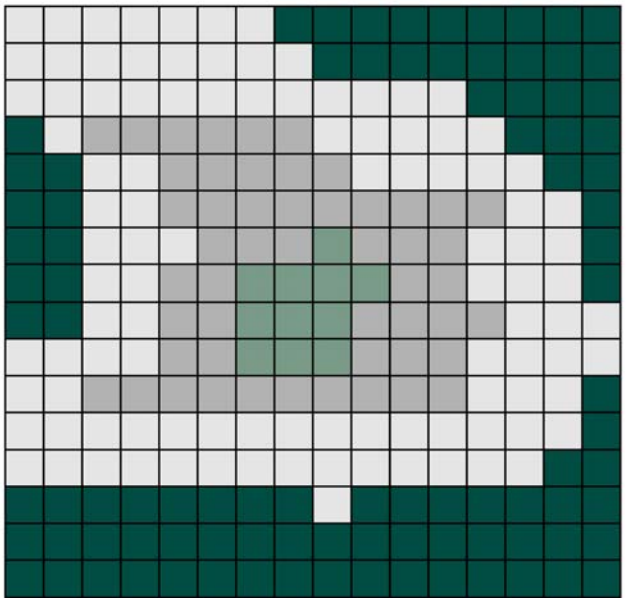
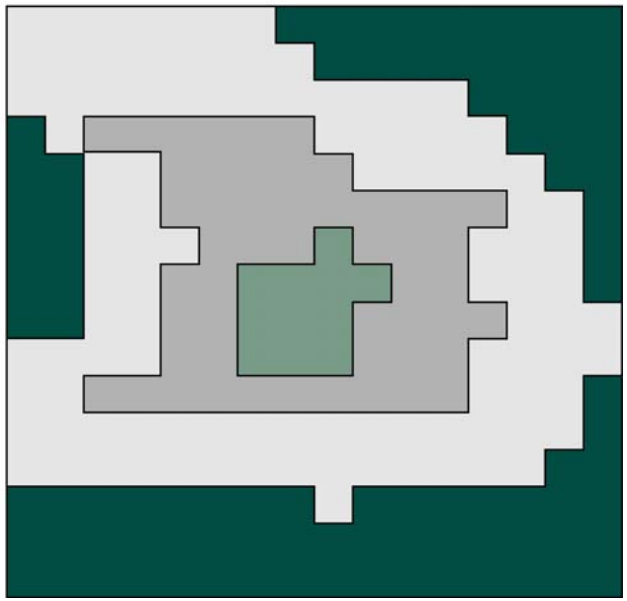
Digitizer

Batch Vectorization

(A)



(B)



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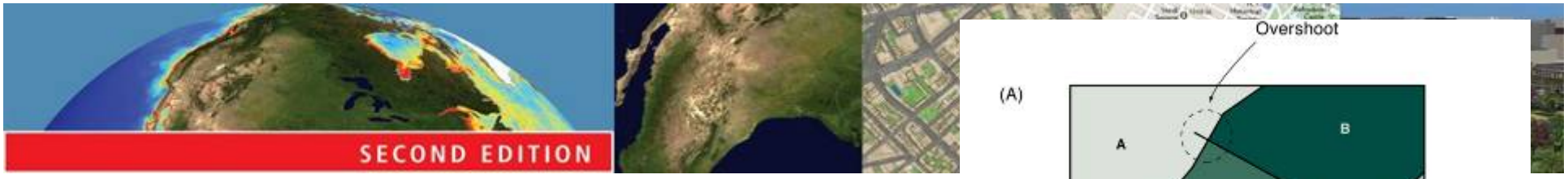
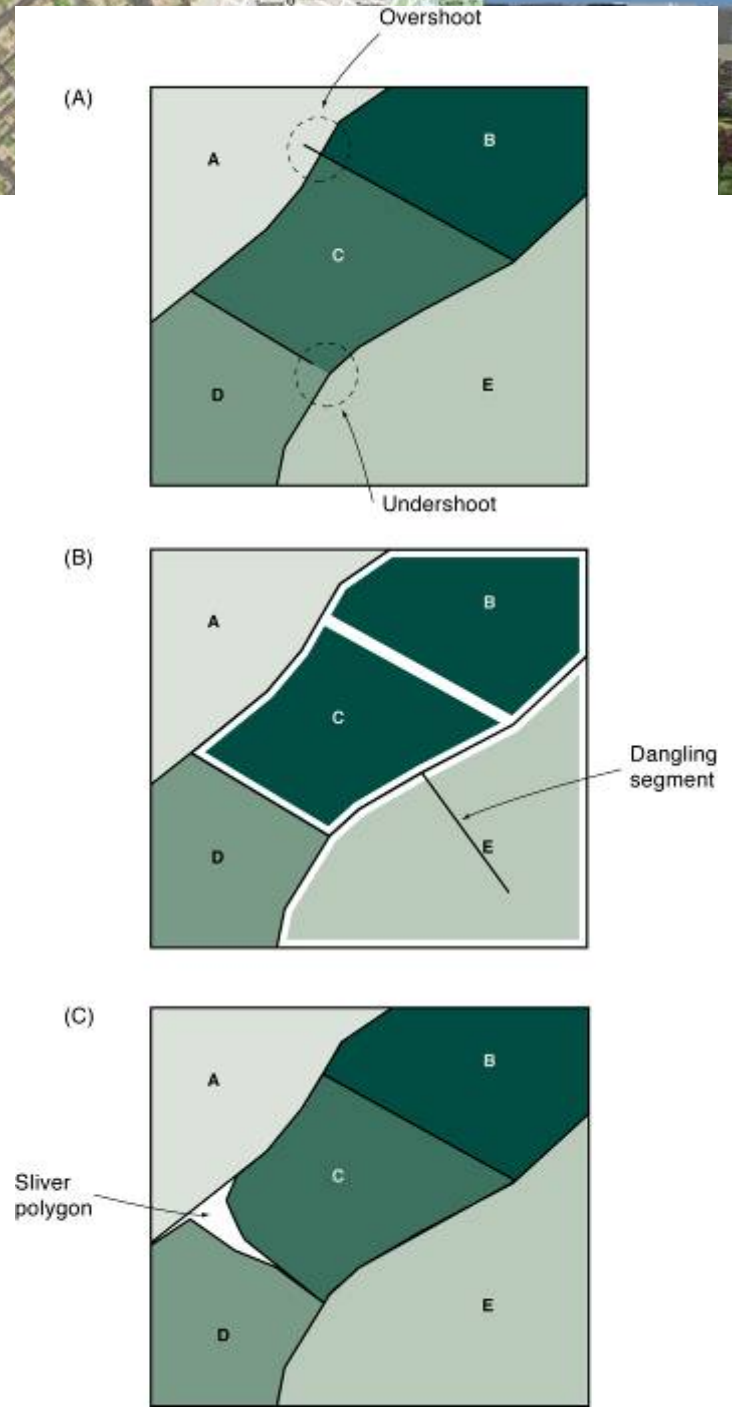


Typology of human errors in digitizing: (A) undershoots and overshoots; (B) invalid polygons; and (C) sliver polygons



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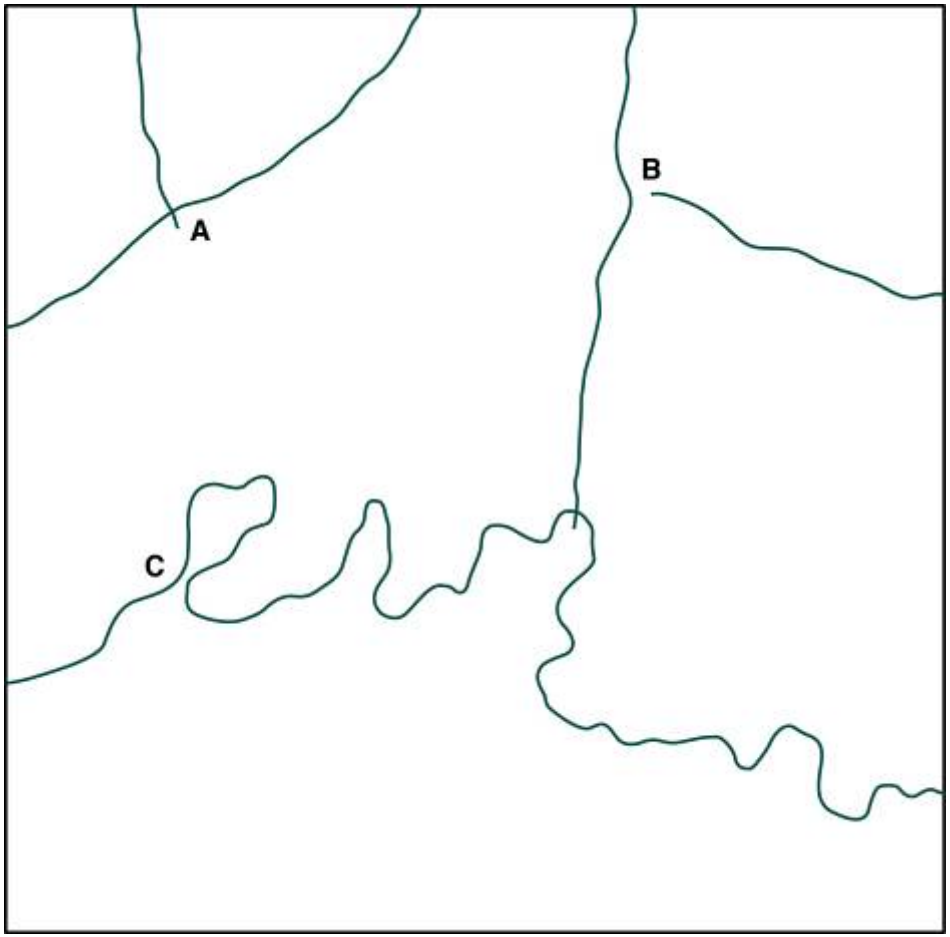
Error induced by data cleaning



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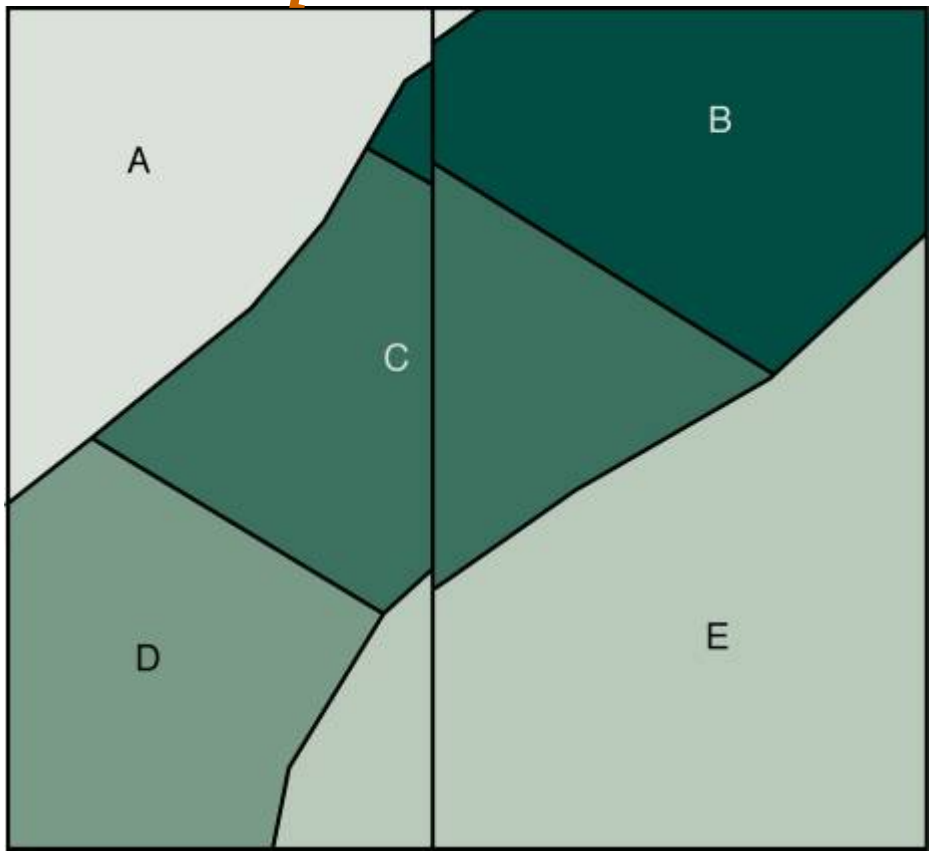
Mismatches of adjacent spatial data sources that require rubber-sheeting



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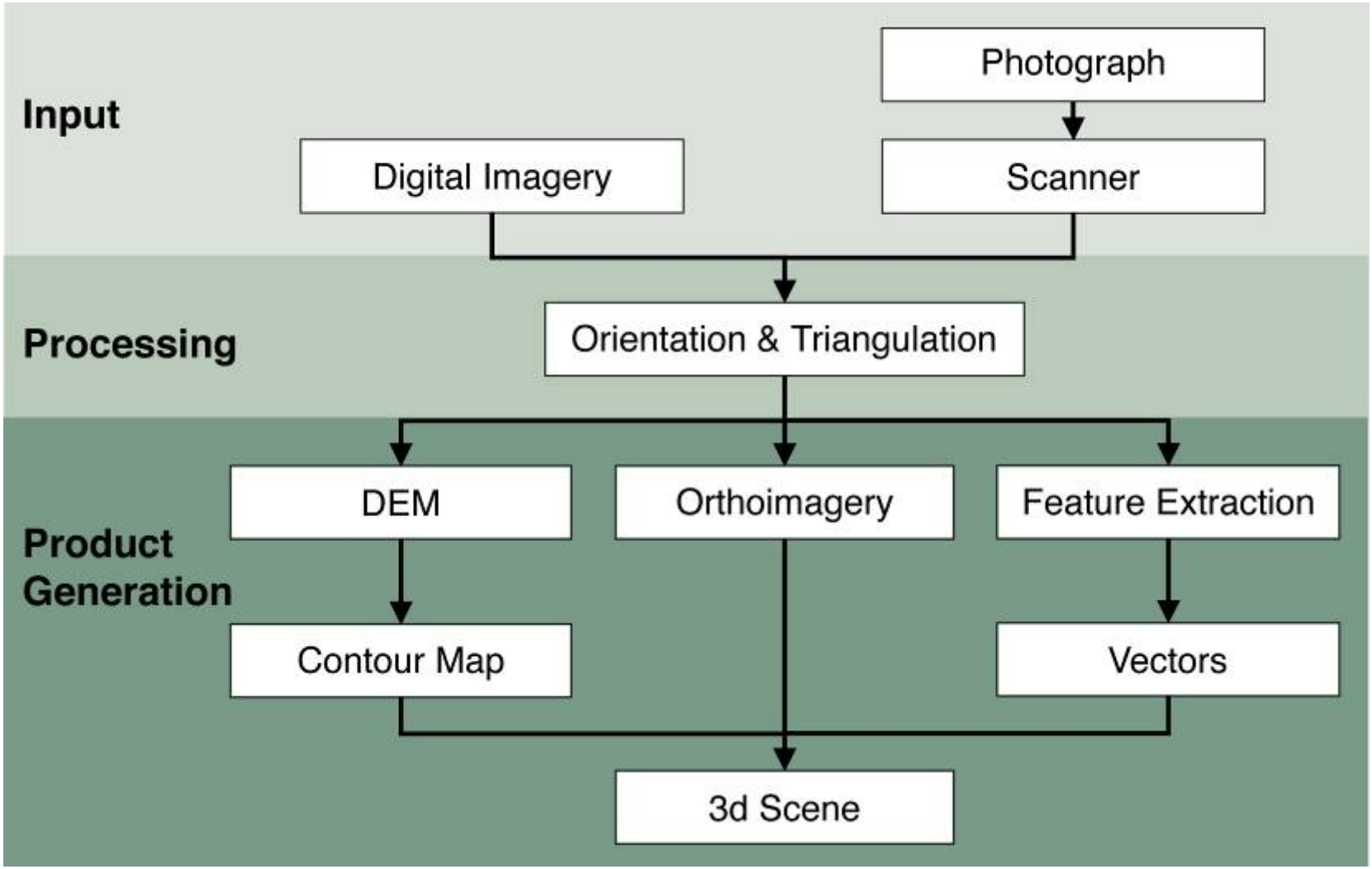

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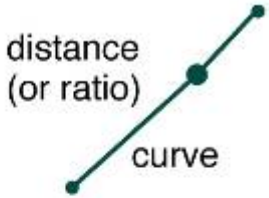
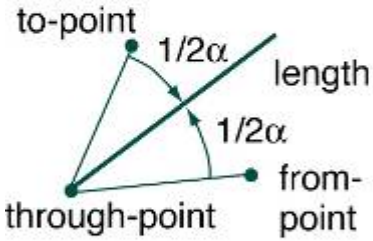
COGO construction tools used to represent geographic features

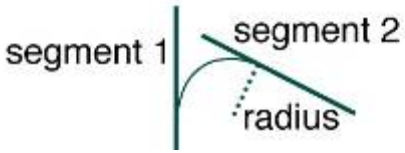
Construct Along



Line Construct Angle Bisector



Construct Fillet



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Data Transfer

- Buy v build is an important question
- Many widely distributed sources of GI
- Key catalogs include
  - US NSDI Clearinghouse network
  - Geography Network
- Access technologies
  - Translation
  - Direct read

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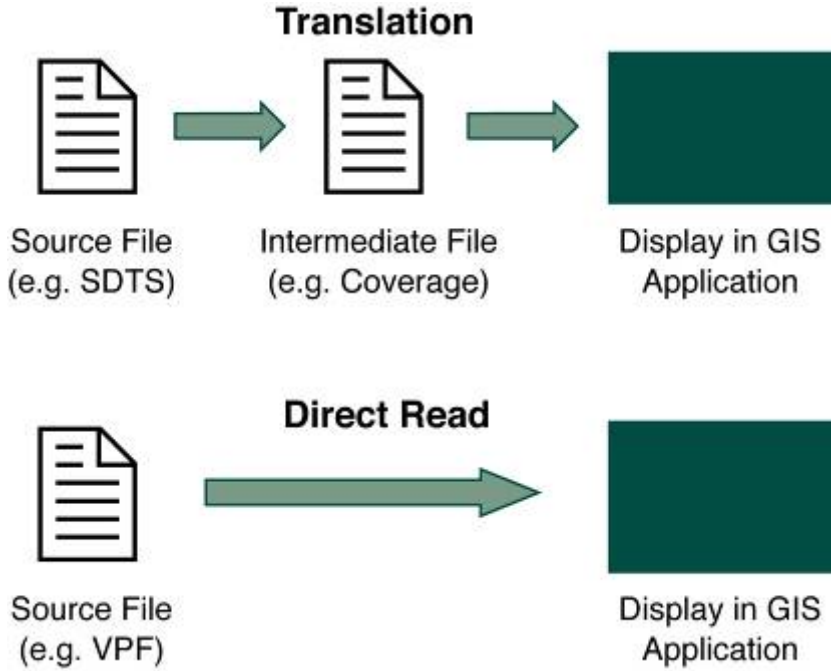
Comparison of data access by translation and direct read



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Managing Data Capture Projects

- Key principles
  - Clear plan, adequate resources, appropriate funding, and sufficient time
- Fundamental tradeoff between
  - Quality, speed and price
- Two strategies
  - Incremental
  - ‘Blitzkrieg’ (all at once)
- Alternative resource options
  - In house
  - Specialist external agency

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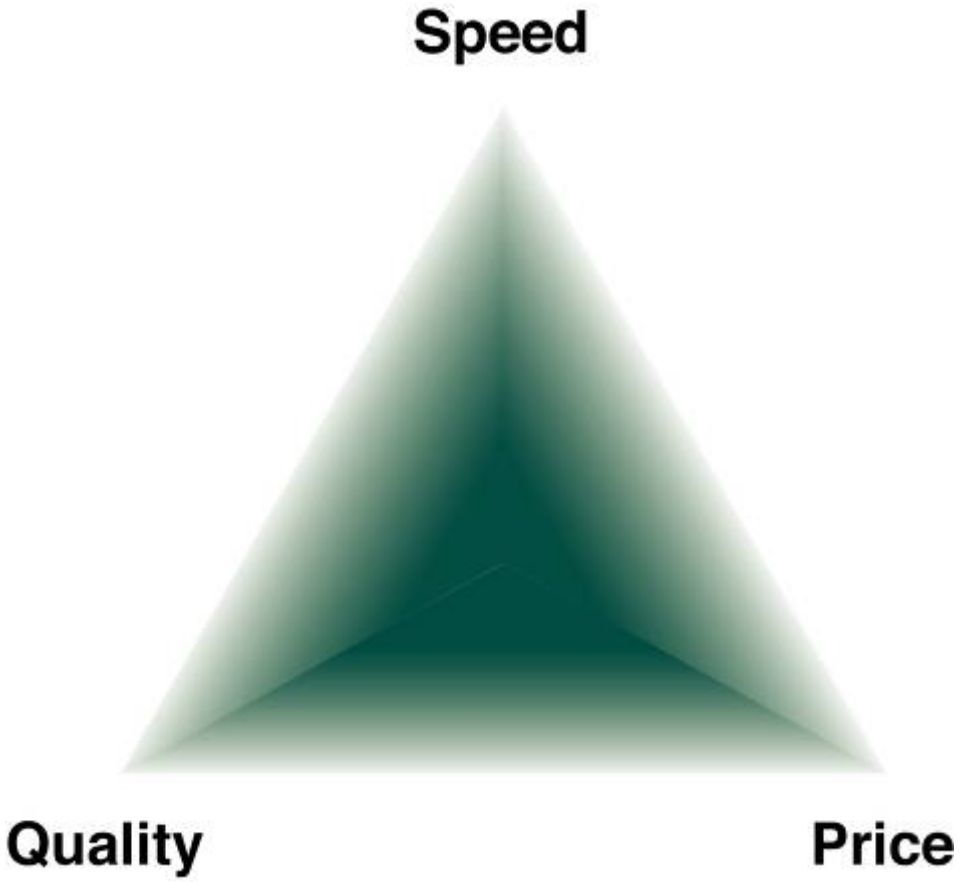
Figure 9.17 Relationship between quality, speed, and price in data capture (Source: after Hohl 1998).



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Summary

- Data collection is very expensive, time-consuming, tedious and error prone
- Good procedures required for large scale collection projects
- Main techniques
  - Primary
    - Raster – e.g. remote sensing
    - Vector – e.g. field survey
  - Secondary
    - Raster – e.g. scanning
    - Vector – e.g. table digitizing

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