GEO 309 – Intro to GIS

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Topics

- Discussion – Crampton
  - What is critical cartography and GIS?
- What is GIS?
- GIS vs Maps
- Brief History of GIS
- Major Components of GIS
- Applications of GIS
- Benefits/Limitations of GIS
- QGIS Review

Discussion - Crampton

- What is critical cartography and GIS?
  - Crampton, J. 2010. What is critical cartography and GIS. In Crampton, J. (2010) Mapping: A critical introduction to cartography and GIS. Oxford: Blackwell. 39-48.

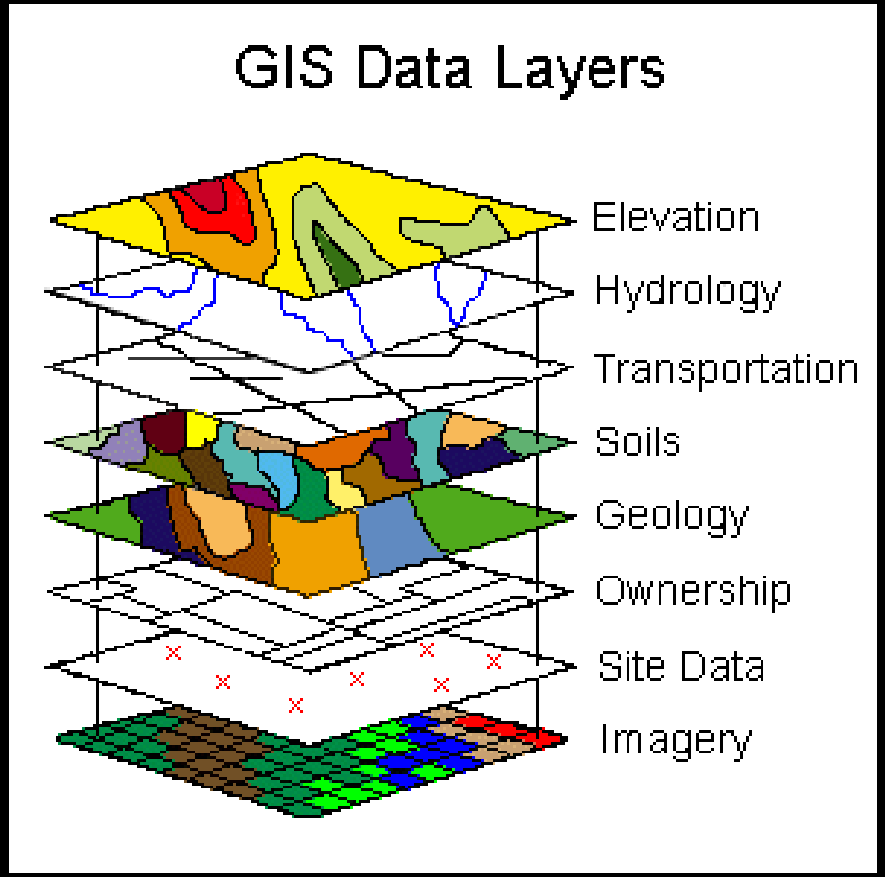
What is GIS?

- Geographic Information Systems
  - “A powerful set of tools for collecting, storing, retrieving, transforming and displaying spatial data from the real world.” - Burrough (1986)
  - “Automated systems for the capture, storage, retrieval, analyses and display of spatial data.” - Clarke (1995)
- GIScience
  - Theory and Practice

GIS vs. Map

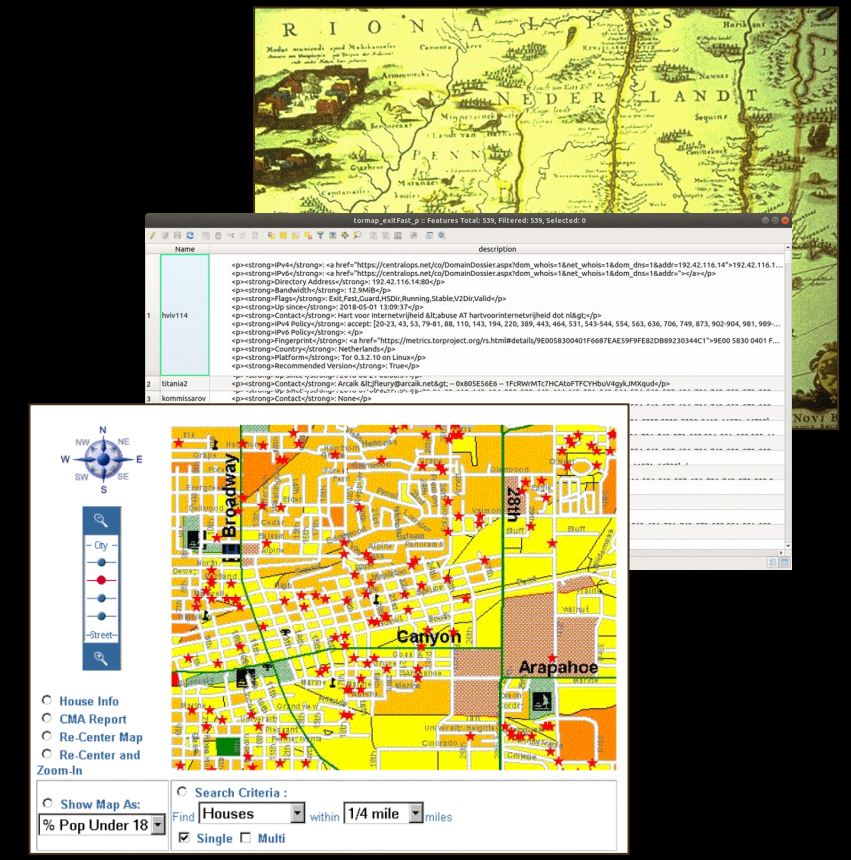
- GIS
  - Links map features with lists of attributes
  - Displays map features based on their attributes
  - Link between map features and attributes is *dynamic*

GIS vs. Map


GIS Data Layers
Elevation
Hydrology
Transportation
Soils
Geology
Ownership
Site Data
Imagery

A Brief History of GIS

- Computer Mapping (1970s)
  - automates the cartographic process
- Spatial Database Management (1980s)
  - links computer mapping techniques with traditional database capabilities
- GIS Modeling (1990s)
  - representation of relationships within and among mapped data
- Web Mapping (2000s)
  - digital mapping online



Major Components of a GIS

- Hardware
- Software
- Personnel

Major Components of a GIS

- Hardware
  - Computer (Desktop, Laptop, Tablet, Mobile)
  - Internet/Intranet Infrastructure
  - GPS/Satellite
  - Data Storage (Physical, Cloud)
  - Digitizers & Scanners
  - Printers and Plotters

Major Components of a GIS

- Software – Data Input

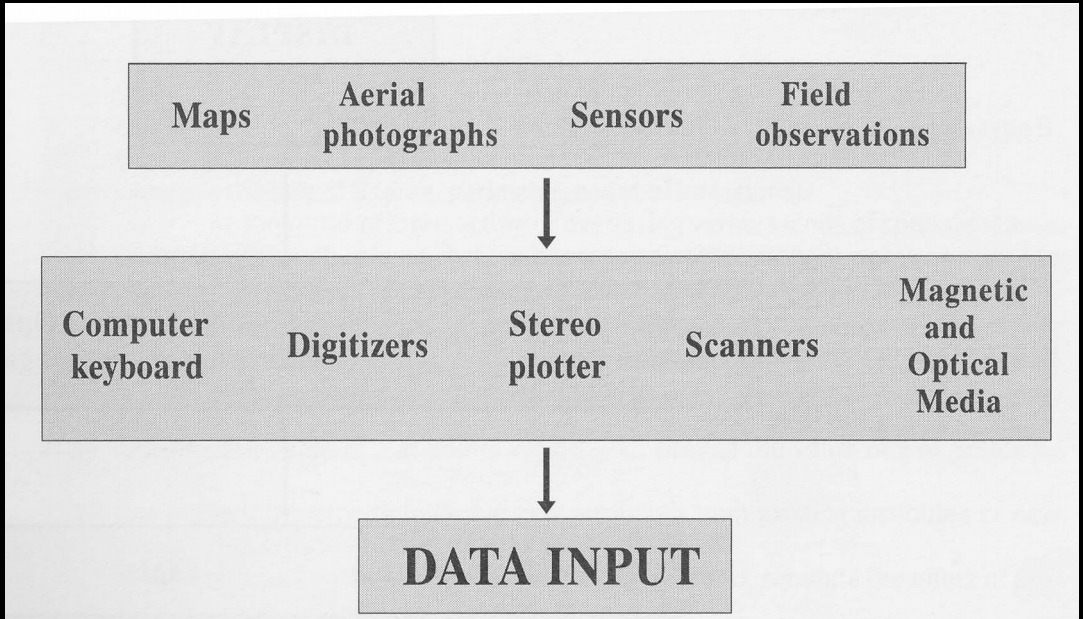


Figure 1.5. Data collection and input

Major Components of a GIS

- Software – Data Storage/Management
  - Computer hardware
    - Hard Drive, Thumb Drives, Optical
  - Database Management System (DBMS)
    - Store (retains integrity)
    - Manage (minimum access times, simple updates)
    - Analyze (several tools: PostGIS)

Major Components of a GIS

- Software – Geographic Analysis System
  - Reclassification
  - Overlay
  - Query
  - Buffer
  - Map Algebra
  - Models and Simulations

Major Components of a GIS

- Software – Statistical Analysis
  - Traditional statistical procedures
    - Chi-square
    - Coincidence analysis
    - Principle component analysis
  - Geostatistical procedures
    - Inverse distance
    - Semivariogram
    - Kriging

Major Components of a GIS

- Software – Data Output & Visualization

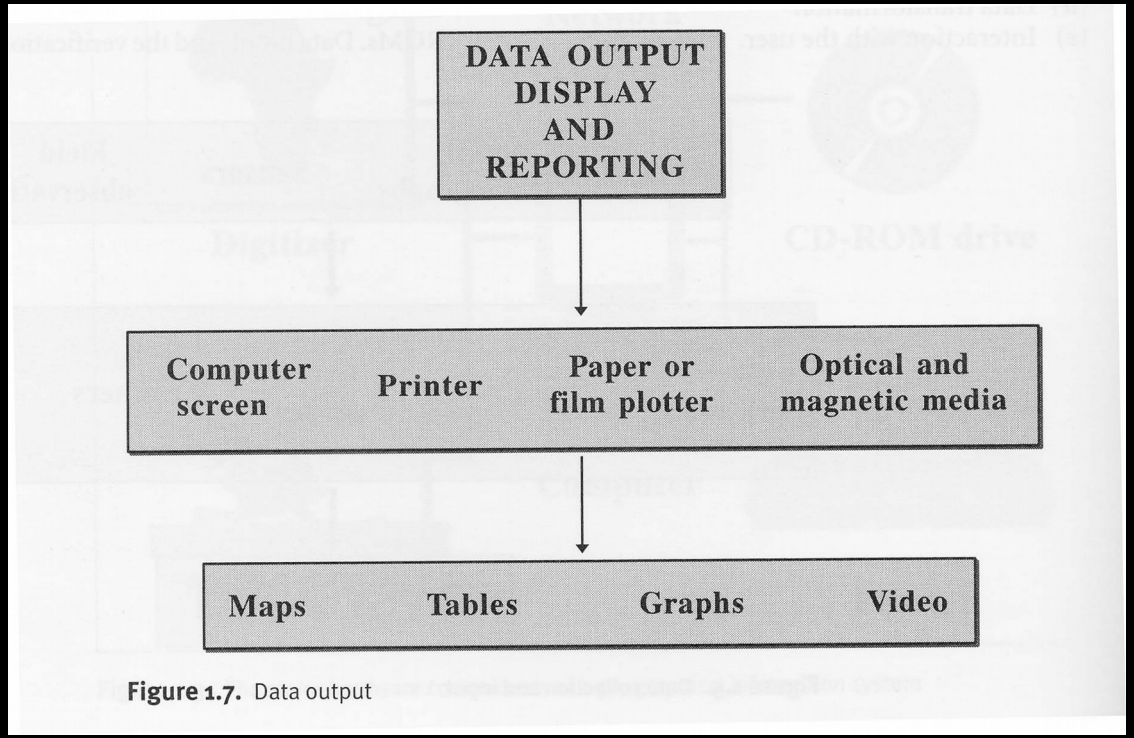


Figure 1.7. Data output

Major Components of a GIS

- Software – Data Transformation
  - Transformation needed to remove errors
  - Bring them to up to date
  - Match them to other data sets

Application of GIS

- Natural Resources Management
- Facility Management
- Land Information System
- Business Intelligence/Analysis
- Emergency Response System
- Data Science
- More…

Benefits of GIS

- Facilitates
  - Understanding of a problem in spatial context
  - Generation & analysis of spatial data
  - Analytic updates of non-spatial data/information
  - Visualization
- Facilitates decision making processes
  - Knowledge, power, control

Limitations of GIS

- Not a “covers-all” technique
- Often oversold
- Information is not a solution
  - Depends on decision making process
- Prone to human error
  - Hypothesis, data processing, modeling

Limitations of GIS

- Lack of compatible data limits performance
- Inherent uncertainty of data
  - Limitation of GIS tools to adjust/cope
- Running costs
  - Licenses & Support
  - Data Sources and proprietary formats
  - Adoption, Development, Learning Curves