Advanced GIS
Lecture 1 intro

Rowan University

Why GIS Matters

- Almost everything happens somewhere
- Knowing *where* some things happen is critically important
  - Position of country boundaries
  - Location of hospitals
  - Routing delivery vehicles
  - Management of forest stands
  - …

Partition of Bosnia and Herzegovina

Terminology

- Geographic – Earth's surface and near-surface
- Spatial – any space (including geographic) e.g. medical imaging
  - Geospatial = geographic

Geography ↔ Information

- What's here?
  - information = *f* (location)
- Where's this?
  - location = *f* (information)
- Everything GISs do is an elaboration of these two functions

GI is Special

- Multidimensional
- Voluminous
- Requires projection to flat surface
- Unique analysis methods
- Analyses require data integration
- Data updates are expensive and time consuming
- Map displays require fast data retrieval

Information on the World

- How it looks – Form
- How it works – Process
- Knowledge about process more valuable than form, because can be used to predict
- GIS combine
  - General scientific knowledge in software
  - Specific information in databases

Geographic Information Systems

- Software product
- Data sets / databases
- Community of people working with geographic information and tools
- Activity of advanced science and problem solving

Geographic Information System

- Container of maps
- Computerized tools for solving geographic problems
- Spatial decision support system
- Mechanized inventory of geographically distributed features and facilities
- Method for revealing patterns and processes in geographic information
- Toll to automate time-consuming tasks

Brief History of GIS

- 1960 – 70s Innovation
  - First GIS – Canada Land Inventory
  - DIME US Bureau of Census
  - Harvard Laboratory for Computer Graphics
  - Major vendors started (e.g. ESRI, Intergraph)
  - Landsat satellite launched
  - Key academic conferences (e.g. AutoCarto)

Brief History of GIS

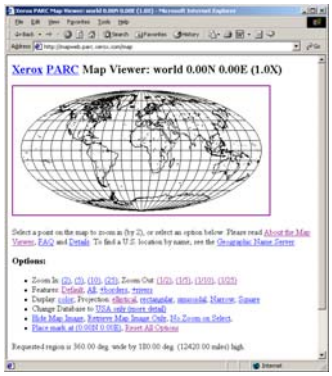
- 1980s Commercialization
  - Commercial GIS software (e.g. ArcInfo)
  - First GIS textbooks
  - First global data sets
  - Clinton Executive Order
- 2000s Exploitation
  - Internet becomes major deliver vehicle
  - More than 1 million active users

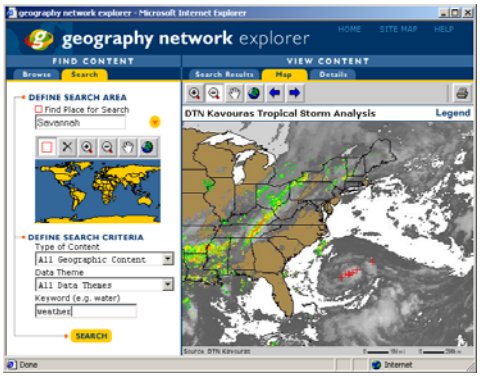
GIS is …

- (Tomlinson, 1973) A system that can
  - "transform map data into a structured, non-graphic format amenable to computer processing"
  - "provide a set of procedures that can efficiently operate on the shared data"
- (Burrough and McDonnell, 1998):
  - "a set of tools for collecting, storing, retrieving at will, transforming, and displaying spatial data from the real world"

First Internet Mapping Site

The thing that would not die…





Business of GIS

- GIS industry is worth over $10 billion
  - Software
  - Data
  - Services
  - Publishing
  - Education

GISystems, GIScience and GIStudies

- GISystems
  - Emphasis on technology and tools
- GIScience
  - Fundamental issues raised by the use of GIS and related technologies (e.g.)
    - Spatial analysis
    - Map projections
    - Accuracy
    - Scientific visualization
- GIStudies
  - Systematic study of the use of geographic information

Social Implications of GIS

- Favors generalization, possibly at expense of minorities and individuals
- Use is not always neutral and can be applied to military and industrial surveillance
- Tendency to be technological rather than human need focused
- Maintains and extends the status quo of societal power structures
- Absence of GIS in critical research

Summary

- GIS is a science based on extensive technology application
- Unique perspective for examining patterns and processes on the Earth's surface
- From origins in 1960s now a +$10B industry

⇒More than enough rope to shoot yourself in the foot…