GEOG 488/588: GIS I Introduction

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What is GIS?

- G: Geographic, Geospatial, Geo
  - Alternatives: Spatial Information Systems, Land Information Systems
- Geography
  - diverse discipline that both contributes to and uses GIS developments
  - concerned with (a) description and understand of **place**s and (b) analysis of patterns and relationships in **space**
  - focuses on planet Earth
- Geographic Information
  - Information about places, objects and events on Earth and the relationships between them

    Components
  - geographically referenced locations (where?)
  - descriptions/attributes (what?)
  - time (when?)

What is GIS? (cont.)

- Information Systems
  - The hardware, software, and people needed to collect, manage, analyze, and report data for the purpose of decision making or scientific investigation
  - we wish to achieve ever higher levels of understanding (volumes of higher level understanding are smaller than lower levels)

data	⇒	information ⇒	knowledge ⇒	*wisdom*
(oceans)		(rivers)	(puddles)	*(drops)*

  - **data** are facts and figures; **information** is data organized in way that makes it useful to somebody; **knowledge** is the accumulated and integrated information on a topic over some period of time and across a broad range of situations
- Information Science
  - the study of information processing methodologies, technologies and organizations and their role in science and society.
- Information Technology
  - specific technological developments that facilitate information processing (e.g., DBMS, computer graphics and visualization)

The ‘S’ in GIS

- the ‘S’ often means **systems**, to refer to the software and hardware used in GIS.
- but the 1990s saw increasing use of GI **Science** to refer to a burgeoning field of study.
  - GIScience deals with the fundamental theories and techniques that underlie GIS development and application, e.g., computational geometry, error and uncertainty assessment, and scale questions.
- increasingly important is the availability of GI **services**.
  - GIServices, or location-based services, provide geographically specific information and can be linked to global positioning systems, wireless networks, and mobile computers.

GIS, then

- can refer to the systems, science, and technology associated with processing geographically referenced data to provide meaningful information to decision makers and other users (e.g., scientists).
- is a technology with links to other geospatial technologies: global positioning systems (GPS), remote sensing, computer cartography.
- can be defined by the processes it provides: data input, data storage and retrieval, data manipulation and analysis, and reporting.

Fields Contributing to GIS Developments

- Cartography
- Cognitive Science
- Computer Science
- Geodesy
- Geography
- Geometry
- Remote Sensing
- Information Science
- Landscape Architecture
- Operations Research
- Statistics
- Surveying

Historical Roots

- 1960s and early 1970s
  - Map measuring: Canada GIS, Roger Tomlinson, 1964
    - Canadian Dept. of Forestry & Rural Development
  - Planning: Census Bureau, DIME files for 1970 census
    - pre-cursor to TIGER files
  - Harvard Graphics Lab., Howard Fisher
    - Jack Dangermond, Nick Chrisman, others
  - ESRI, Jack Dangermond, est 1969
    - makers of Arc/Info, ArcView, etc.

GIS Roots (cont.)

- 1960s and early 1970s (conts.)
  - "Design with Nature", Ian McHarg, 1969
    - map-based overlays for environmental design
  - Quantitative Revolution in Geography
    - developments in quantitative spatial analysis
  - ERTS-1, NASA, 1972
    - launch of first Landsat satellite
  - Computer science developments
  - First of 27 GPS satellites launched
  - Landsat Commercialization, 1984
    - increased cost, hindered application development

GIS Roots (Cont.)

- 1970s and 1980s
  - improvements in cost & capability of computer tech.
  - NCGIA, NSF, Mike Goodchild, 1988
    - National GIS scientific research center
  - GPS, US Govt., 1989
- 1990s
  - widespread commercialization and market growth
  - IT developments continue to affect GIS
    - Network, internet-based mapping
  - Open GIS Consortium
    - establishing standards for interoperability

Trends

- 2003 global GIS business of $multi-billion, growing 10%/year, > 2 mil users
- GIS is just one of many different integrated applications on the desktop
- Mobile and distributed computing get data and software out into the field and in any number of smart appliances (e.g., cars with GPS)
- Flood of data
  - terabytes (10^9 bytes) per day from NASA satellites

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