Introduction to GIS - 1

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Introduction to Geographic Information Systems

Lecture Materials of Prof. Maidment and his colleagues in Texas A&M Univ.
Internet

Topics

- An overview of GIS
- How GIS data are captured, stored, retrieved, analyzed & displayed
- Where to go for more information
- GIS software and its functionality
- How to use a basic GIS (ArcView and Idrisi)

What is a GIS?

What in the world is a “GIS”?
—Item on the Internet’s comp.infosystems.gis FAQ.

GISs are simultaneously the telescope, the microscope, the computer, and the Xerox machine of regional analysis and synthesis of spatial data. (Ron Abler, 1988)

Where Did GIS Come From?

- GIS is built upon knowledge from geography, cartography, computer science and mathematics.
- Geographic Information Science is a new interdisciplinary field built out of the use and theory of GIS.

Defining GIS

- Different definitions of a GIS have evolved in different areas and disciplines.
- All GIS definitions recognize that spatial data are unique because they are linked to maps.
- A GIS at least consists of a database, map information, and a computer-based link between them.
Spatial and non-spatial data

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Definition 1: A GIS is a toolbox

"a powerful set of tools for storing and retrieving at will, transforming and displaying spatial data from the real world for a particular set of purposes"

(Burrough, 1986, p. 6).

"automated systems for the capture, storage, retrieval, analysis, and display of spatial data." (Clarke, 1995, p. 13).

Definition 2: A GIS is an information system

"An information system that is designed to work with data referenced by spatial or geographic coordinates. In other words, a GIS is both a database system with specific capabilities for spatially-referenced data, as well as a set of operations for working with the data" (Star and Estes, 1990, p. 2).

Duecker's 1979 definition (p. 20) has survived the test of time.

"A geographic information system is a special case of information systems where the database consists of observations on spatially distributed features, activities or events, which are definable in space as points, lines, or areas. A geographic information system manipulates data about these points, lines, and areas to retrieve data for ad hoc queries and analyses" (Duecker, 1979, p.106).

The Feature Model

- Duecker's definition uses the feature model of geographic space.
- The standard feature model divides a mapped landscape up into features, that can be points, lines, or areas.
- Using a GIS involves capturing the spatial distribution of features by measurement of the world or of maps.
- Almost all human activity and natural phenomena are spatially distributed, so can be studied using a GIS.
- A GIS uses map features to manage data.
Definition 3: GIS is an approach to science

- Geographic Information Science is research both on and with GIS.
- "the generic issues that surround the use of GIS technology, impede its successful implementation, or emerge from an understanding of its potential capabilities." (Goodchild, 1992)
Sources of Information on GIS

- The amount of information available about GIS can be overwhelming.
- Sources of GIS information include journals and magazines, books, professional societies, the World Wide Web, and conferences.
- GIS has Web Home pages, network conference groups, professional organizations, and user groups.
- Most colleges and universities now offer GIS classes in geography departments.

GIS Resources: Conferences

GIS Resources: Glossies

GIS Resources: Major GIS-Only Journals
- International Journal of Geographical Information Systems
- Geographical Systems
- Transactions in GIS
- Geo Info Systems
- GIS World

Specialty Journals
- Business Geographics
- GIS Law
- GrassClippings
- GIS Asia/Pacific
- GIS World Report/CANADA
- GIS Europe
- Mapping Awareness

Regular GIS Papers
- Annals of the Association of American Geographers
- Cartographica
- Cartography and GIS
- Computer, Computers, Environment, and Urban Systems
- Computers and Geosciences
- IEEE Transactions on Computer Graphics and Applications
- Photogrammetric Engineering and Remote Sensing
Occasional GIS papers

- Cartographic Perspectives
- Cartographica
- Journal of Cartography
- Geocarto International
- IEEE Geosciences
- International Journal of Remote Sensing
- Landscape Ecology
- Remote Sensing Review
- Mapping Science and Remote Sensing
- InfoWorld

Popular Distribution Magazines

- Business geographics
- Geo info systems
- GIS law
- GIS world
- GPS World

Proceedings of Conferences

- AUTOCARTO International Symposium on Automated Cartography.
- GIS/LIS. Sponsored by AAG, ACSM, AM/FM, ASPRS, URISA. Held every year.
- International Advanced Study Symposium on Topological Data Structures for Geographic Information Systems.
- Proceedings International Symposium on Spatial Data Handling, IGU Commission on GIS.
- SSD Advances in spatial databases

Professional Organizations

- AM/FM International Automated Mapping and Facilities Management.
- ACM: American Congress on Surveying and Mapping.

WWW Resources: USGS

WWW Resources: NSDI
WWW Resources: Textbook Pages

Clarke GIS Internet Guide

CSG: Guide to Student Awards, Fellowships and Internships