Geographic Information System (GIS)

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Geographic data Types

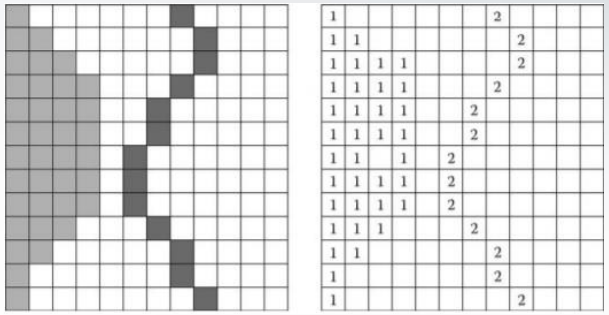
- Geographic data can be classified into two categories:

1. Graphic data: describing features on the map.
2. Non-graphic data: describing values of feature measurements.

Graphic Data

- Point: (●) Is a zero dimensional object that describe a feature on the map such as a house, a tree.
- Line: () is a one dimensional object connecting two points describing a feature on the map such as a river or a road.
- Node: (*) Zero dimensional object describing a topological junction such as intersections of roads.
- Area (Polygon): a feature set of line segments for describing 2 dimensional features such as lake, city boundry.
- Grid/Cell: Each cell has a value.

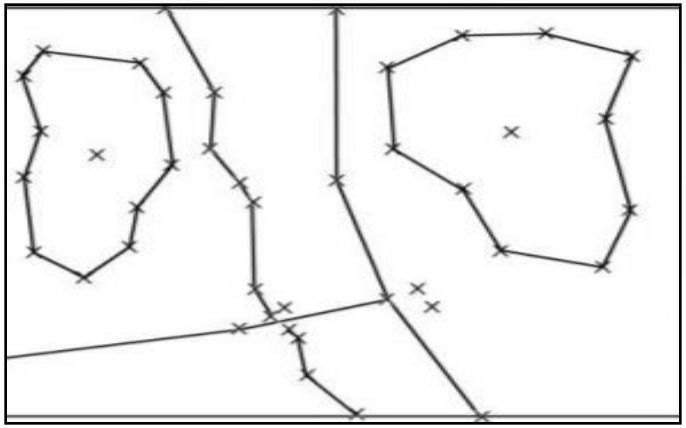
Graphic Data cont.



- Pixel: The same as the cell representation for dealing with images. Each pixel represents the smallest unit in a picture that can not be divided anymore.

Graphic Data Models

- Vector Data Model: Defines the geographic features as coordinates such as point, line, area.



- Raster Data Model: Divide the area into a grid of cells. Each cell has a specific value.

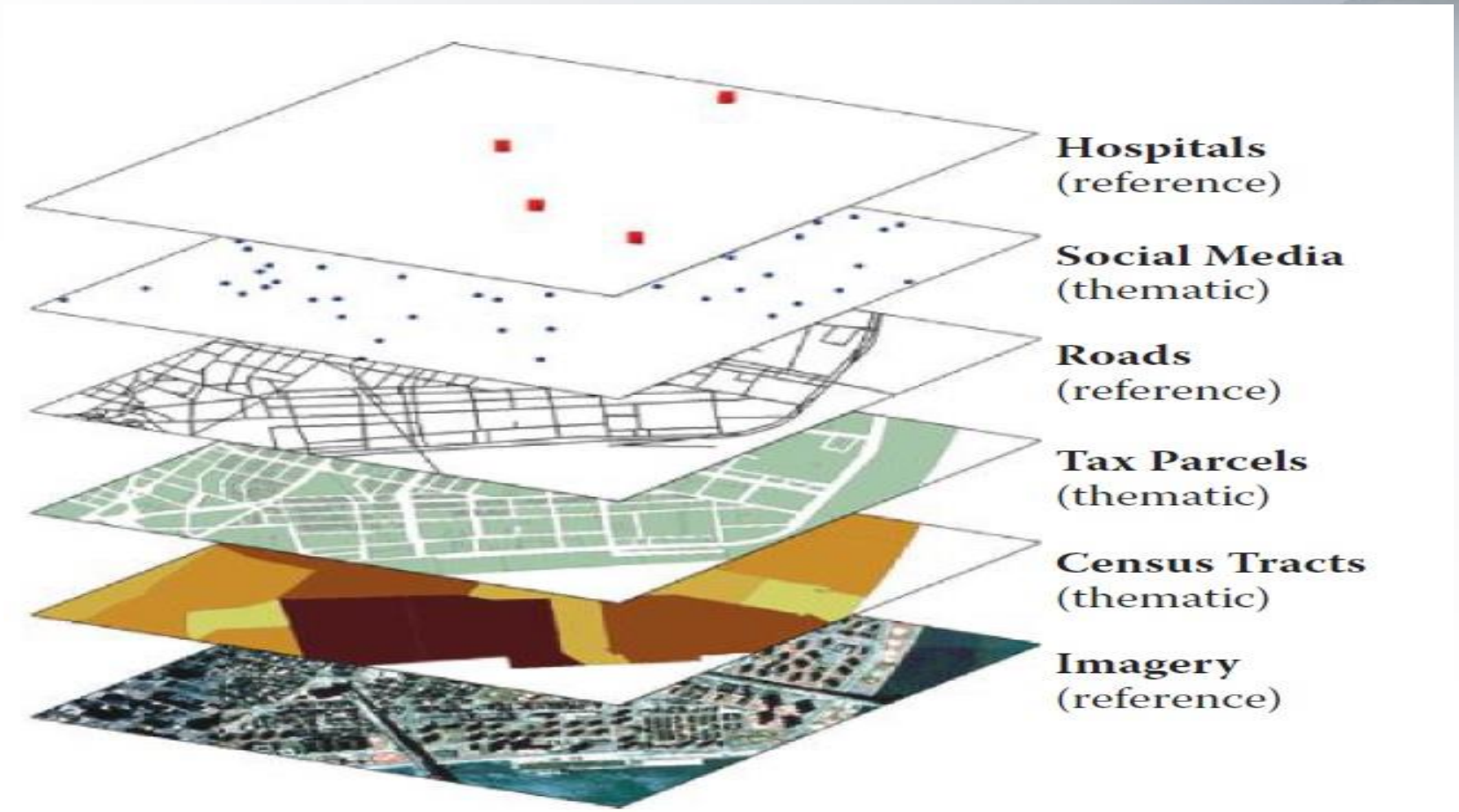
Nongraphic data

- Attributes: (values)
- Geo-Referenced data: Describe some event or action related to a location on the earth.
- Geographic index: Used as an identifier and sometimes for linking graphic with nongraphic data.
- Spatial relationships: describe relationships between features such as (adjacency, Connectivity, proximity)

Layers

- Is a set of homogenous features registered positionally to other layers in the database.
- The base map (Reference map)is divided into a set of thematic maps. Each one describe only one feature such as temperature, soil type, etc.

Layers cont.


Hospitals
(reference)
Social Media
(thematic)
Roads
(reference)
Tax Parcels
(thematic)
Census Tracts
(thematic)
Imagery
(reference)

What is Remote Sensing?

- Is the technique of collecting information from a distance.
- Data collected from a distance are named Remotely sensed data.

Remote Sensing Techniques

1. Photographic Cameras (Aerial Photography).
2. Electro-optical scanners.
3. Land satellite.
4. SPOT (System Pour L’observation de Laterre)

Steps for Analysing Remotely Sensed Data

1. Defining the information needed.
2. Collection of information using remote sensing and other techniques.
3. Information Analysis.
4. Verification of the results of the analysis.
5. Reporting of the obtained results to the users.
6. Taking some action or a decision.

Steps for Analysing Remotely Sensed Data

1. Defining the information needed.

   Before any data collection, the required information should be specified. Its required accuracy, coverage, time, the data collection cost and the format (either electronic, paper maps or tabulated stats).

Steps for Analysing Remotely Sensed Data cont.

2. Collection of information using remote sensing and other techniques.

- Remotely sensed data are not used alone. They are combined with other data sources such as field observations or existing maps.
- The data collection devices detect energy reflected or emitted from earth objects. The reflected light energy is recorded as black-white or coloured images

Steps for Analysing Remotely Sensed Data cont.

3. Information Analysis.

There are three basic types of analysis:-

- Measurement: Use the sensed values of measurements for calculating environmental conditions such as soil type, moisture, crop conditions.
- Classification: Define regions with similar features. They can be coded with the same colour on the map.
- Estimation: Is used to estimate the quantity of a material such as the quantity of wheat in an area.

Steps for Analysing Remotely Sensed Data cont.

4. Verification of the results of the analysis.

- The verification is important for measuring the level of accuracy of the collected data.

- It is done by taking a sample of points from the map and comparing it with independent measurements such as field surveys. If the accuracy is too low, reject the map.

Steps for Analysing Remotely Sensed Data cont.

5. Reporting of the obtained results to the users.

- After checking the quality of the produced information, the information can then be produced in a suitable format. It can be produced as paper maps, annotated images, a computer data file.
- The chosen format should be suitable for the end user of the information.

Steps for Analysing Remotely Sensed Data cont.

6. Taking some action or a decision.

The main objective of producing information is helping in decision making.

The information is useless if :

- There is no end user for it.
- The information never reach the intended user.
- It is not in the suitable format.

Other Geo-data Sources

1. GIS Data Depot

GIS Data Depot (/www.gisdatadepot.com)

- provides free spatial data.
- commercial spatial data that you can purchase.
- You need to be proficient in GIS and have access to GIS software.

Other Geo-data Sources cont.

2. Environmental Systems Research Institute(ESRI)

- In addition to being a huge player in the GIS software and consulting industry, ESRI provides a wide range of spatial data for use with its many products.
- ESRI provides the data on DVDs that include HTML help systems that have information about redistribution and a complete set of metadata. ESRI also has an ArcGIS Online Content Sharing Program to allow organizations to share spatial data.

Other Geo-data Sources cont.

3. National Geospatial Data Clearinghouse(NGDC)

- A direct outcome of the United States' Federal Geographic Data Committee's (FGDC) collaborative activity was the establishment of a group of about 250 cooperating government bodies in the United States called the National Geospatial Data Clearinghouse (NGDC).
- Organizations must apply for membership in the network and satisfy the FGDC standards to belong. The EROS Data Centre (a USGS-run geospatial data facility) and the FGDC host the clearinghouse data.
- The NGDC provides well-organized and complete metadata. You can easily access that metadata — but NGDC doesn't commonly offer additional tools.

Other Geo-data Sources cont.

4. Centre for International Earth Science Information Network (CIESIN)

   CIESIN, housed and operated by Columbia University's Earth Institute, provides data, education, support, and research on data integration. Its interests focus primarily on human and environment interactions, which give CIESIN a decidedly more focused perspective on the datasets it provides and on its mission.

Other Geo-data Sources cont.

5. Go-Geo!

   Go-Geo! is a United Kingdom (U.K.) geospatial data port that focuses predominantly on the academic community.

   Funded by the Joint Information Systems Committee (JISC) and operated by the University of Essex and the University of Edinburgh.

   Go-Geo! provides an opportunity to discover, locate, and retrieve data that would otherwise be difficult to find.

Other Geo-data Sources cont.

6. Instituto National de Estadistica Geographia e Informatica (INEGI)

   INEGI, the National Institute of Statistics, Geography, and Data Processing for Mexico, is a government body that collects and organizes statistical, geographic, and economic information about the country.

Other Geo-data Sources cont.

7. CGIAR Consortium for Spatial Information (CGIAR-CSI)

   CGIAR is an initiative of scientists who have a common interest in international agricultural research. With 15 centres worldwide.

   the mission is to apply and advance geospatial sciences, primarily for international sustainable agriculture, natural resource management, conservation of biodiversity, and the alleviation of poverty in developing countries.

Other Geo-data Sources cont.

8. Australian Consortium for the Asian Spatial Information and Analysis Network (ACASIAN)

ACASIAN is an applied academic organization interested in the use of GIS databases for Asia (primarily China) and the former Soviet Union.

341 datasets are licensed and for sale, and ACASIAN encourages collaborative research that uses its datasets. ACASIAN can provide datasets that include special projections for additional fees.

Other Geo-data Sources cont.

9. Geoscience Australia

Part of the Australian Government's Department of Resources, Energy, and Tourism, Geoscience Australia produces geo-scientific information and knowledge.

The primary applications are related to decision-making for resource exploration, environmental management, and maintaining the infrastructure critical for the well-being of Australian citizens.

It provides hardcopy maps and aerial photography, in addition to its digital products.

Other Geo-data Sources cont.

10. Canada Geospatial Data Infrastructure

The Canada Geospatial Data Infrastructure (CGDI) is a combination of technology, geographic data standards, methods, and protocols needed to coordinate and manage Canadian geospatial databases.

The databases include topographic maps, aerial photography, satellite imagery, and environmental data (including forestry, soil, marine, and biodiversity inventories). They also contain socioeconomic and demographic (Census) data, and electoral boundaries. The primary purposes for maintaining this managed resource include geospatial analyses to benefit public health, safety and security, the environment.

Review

1. Geographic data Types.
2. Remote Sensing
3. Steps for analysing Remotely sensed data
4. Other geographic data sources.

Thank You

Questions ??