PDHonline Course L153G (5 PDH)

Geographic Information Systems (GIS)–Hardware and software in GIS

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Slide 1

Lecture 4 Content

❑**Geographic Information Systems (GIS)**

▀▀ **GIS Hardware and Software considerations** ▀

(Continued)

This lecture is a continuation of the hardware and software discussion with the emphasis on GIS.

Slide 2

□GIS Software requirements

– **Graphic Processing Functions**

– **Database Management Functions**

– **Basic Cartographic and Geographic Functions**

– **Other related Functions**

Each of these requirements are discussed in the following slides

This slide shows the content of this lecture. The four functions listed are the basic requirements which all GIS software should contain. Each of the function is discussed further in the following slides.

Slide 3

❑ <u>Graphic Processing Functions</u>

a)Graphic Entry Capabilities

➢ Digitizing

– **Conversion of hardcopy maps to digital form by using a digitizing table**

➢ Special feature entry

– **Defined graphic primitives using coordinates for example:**

» **Rectangles, arcs, curves, etc.**

All GIS software must be capable of adding features into spatial databases and attributes to the attribute databases. There are four types of graphic processing functions. One is shown in this slide. The interactive digitizing is self explanatory while the special feature entry refers to the graphics which is available as icons in the graphical user interface of the GIS software such as arcs, lines, squares, and such like.

b) Annotation Entry

Labeling map features in a display and providing necessary texts for map title and legends

c) Graphic edit capabilities

– **Delete, modification, special commands for overshoot, undershoot, closed shapes, etc.**

– **Generalization of map features and the smoothing of features which is dependent upon the initial map scale at which the data was captured**

The second type of graphic processing functions is annotation. This is adding labels to the graphic features in the spatial database. The annotation can be text added as graphics or text obtained from the attribute table.

The third type of graphic processing functions is the ability to perform graphic edits on the spatial database. This includes deleting, adding, merging, and such like of features. Generalization is the smoothening of the large scale details to get a small scale version. This is in most instances involve the omission, exaggeration, and displacement of details,

d) Graphic display and plotting capabilities

- **Patterning (eg. Hatching) to represent features without using the full coloring of the feature**
- **Shading to represent features with variations in texture**
- **Coloring to represent features with variations of color**
- **Text font to represent features with variations text and its fonts**
- **Map design capabilities are influenced by the limitations of the plotting hardware**

The fifth graphic processing functions are shown on this slide. The GIS software must be able to display maps using patterns, colors, different text fonts, and such like. The hardcopy output depends upon the plotting hardware available. If a detailed map is created using the GIS then the output hardware must be capable of printing off the map as shown on the monitor.

❑Data management functions

a)Data definition language (DDL)

- **It allows users to describe the characteristics (or schema) for files that contains non graphic attributes**

b)Data manipulation language (DML)

- **It allows you to extract data based on a user-defined criteria which is useful for defining GIS queries**
- **Structured Query Language (SQL) is commonly used**

c)Linkage of non-graphic data with graphic data which is the main importance of GIS

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The second GIS software capability is Data Management functions. This is the ability to define attribute tables, query these tables, and link tables within spatial databases.

Slide 7

❑Basic cartographic and geographic analysis functions

➢Map coordinate and geometric transformation

– **Coordinate transformation**

– **Projection transformation**

➢Basic cartographic functions

– **Edgematching**

– **Map merging**

– **windowing**

The third GIS software capability is the ability to define projections systems for the spatial databases and the ability to perform some basic cartographic functions such as matching the edge of the maps that are in a series, (this process is called Edgematching). Some software refers to the same by the term of "Map merging". Windowing is the ability to zoom in and zoom out areas of interest.

Slide 8

> **Analysis and measurement functions**
> - **Overlaying multiple data sets of the same area**
> - **Buffering an area or graphic feature of interest**
> - **Distance, area, perimeter measurements**
> - **Selection of a radius to search for particular data sets**

> **Address matching**
> - **Plotting of points using the addresses and road network**

> **Terrain modeling**
> - **Creating a close enough approximation of the landform**

> **Network analysis**
> - **Making use of road networks to investigate catchments and routing application**

This slide shows other basic cartographic and geographic analysis functions. For the moment each of these functions are self-explanatory on the slide. Further details will be covered later on in the course series.

❑Other related Functions

– **Raster / Vector conversion**

  • **Raster data is pixel data while Vector data is coordinate data**

  • **conversion from coordinated data sets**

     to pixel data sets

– **Vector / Raster overlay**

  • **overlaying coordinated data for the same area**

  • **overlaying varying pixel data for the same area**

– **Translation functions**

  • **Conversion from one particular data format to another**

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These are some other related functions available in GIS software. They are related to the conversion of the data structures which are used in GIS. Vector is coordinate data, while raster data is pixel data. There is a conversion process to convert between the two structures.

Slide 10

… The End …