**PDHonline Course L154G (5 PDH)**

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# Data in GIS

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Slide 1

## Lecture 3 Content

- **Geographic Information Systems (GIS)**

**Data in GIS – Acquisition and input**

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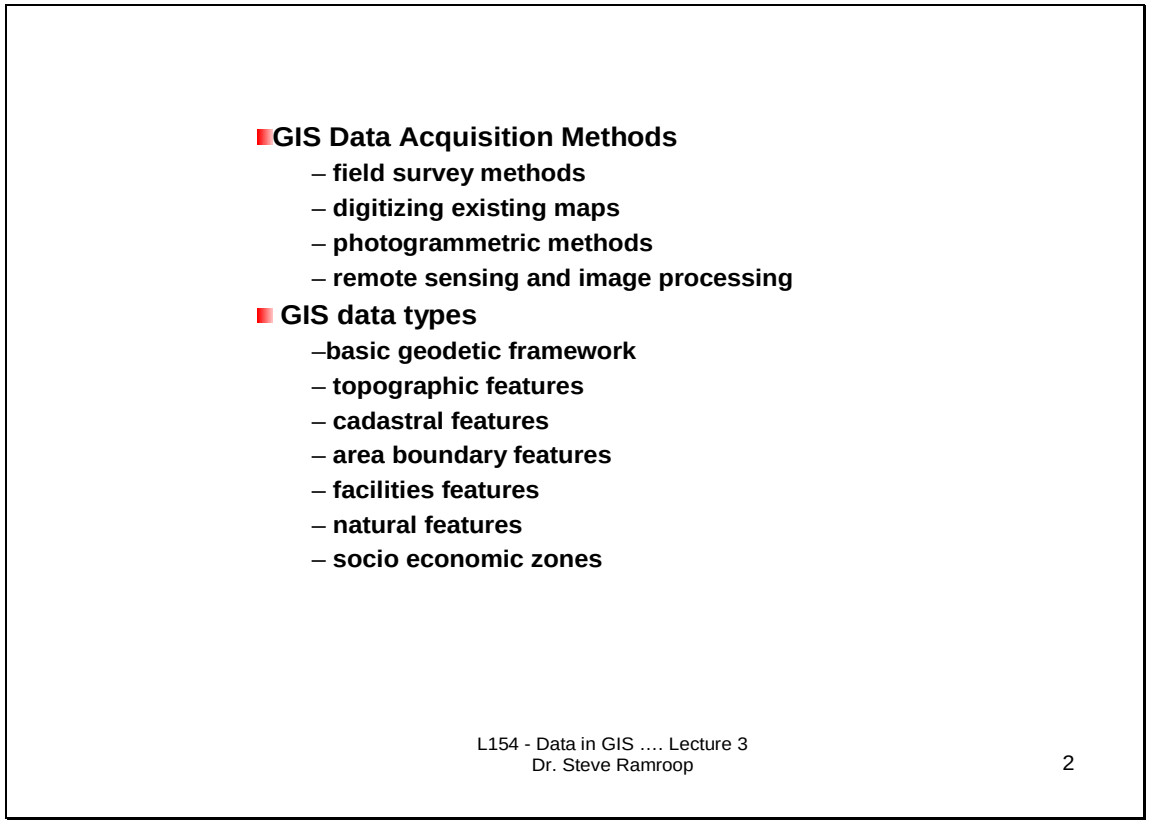
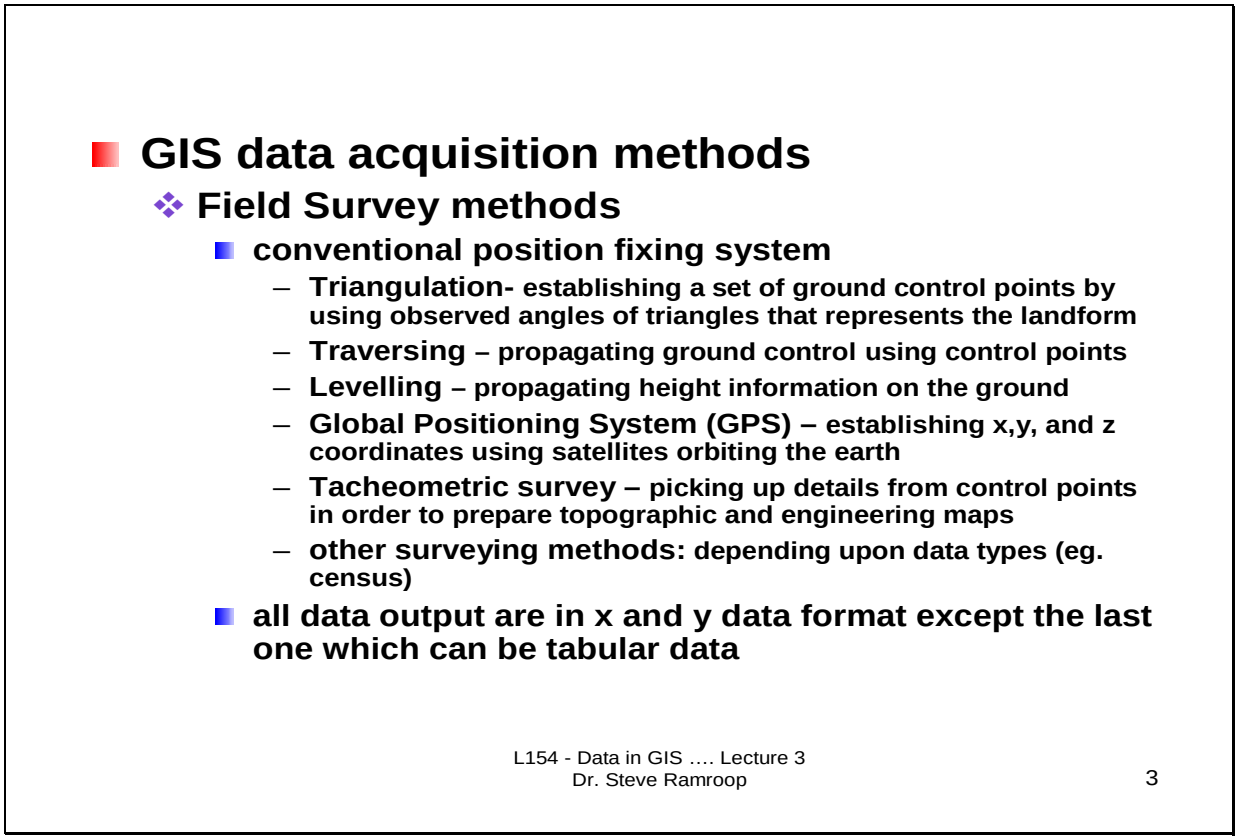
This lecture is a continuation of the data in GIS topics identified in the course description, that is data in GIS – Acquisition and input. In this lecture we discuss some of the data acquisition methods and the different data types.

Slide 2




This slide shows the content of this lecture 3. In this lecture some basic understanding of the listed data acquisition methods are presented. The data acquisition methods are varied and depend upon the accuracy of the data which is required in the GIS application. The most traditional method of capturing data is through field survey methods while the most common method of capturing small scale data sets is through the use of satellite remote sensing. In this lecture is discussed a sample of a few data types which are typically used in GIS application development.

Slide 3




The first data acquisition method is through field survey methods. There are various field survey methods for the various professions. Typically, the most common methods are through the Geomatics field where surveying instruments are used to capture data from the field. Data such as angles, distances, coordinates, and such like are typical data sets captured from the Geomatics field which are processed to generate the coordinates of points lines and area features.

Triangulation, traversing, leveling, GPS, and tacheometry are some of the common surveying methods used out in the field.

In addition, on this slide is identified a number of other position fixing methods which are typically used by other professions. For example, the marketing profession would collect census data through questionnaires, or the biologist will take soil samples, and such like.

Slide 4

- **Digitizing existing maps**
  - **manual digitizing (coordinate data)**
  - **scan digitizing (pixel data)**
  - **on-screen digitizing (semi-automatic which makes use of line following capabilities**
- **For the last two methods it is required that color separates be used for color mapping. A separate is the term used for map features of a particular type (eg. Rivers). A collection of separates are overlaid to produce a map. It is these separates which should be scanned in order to have the map features distinct from other map features.**
- **scanned data need conversion into coordinate (pixel - coordinate conversion) and requires coding for GIS input**
- **Involves rasterization and vectorization processes**
  - **inaccuracies are involved in the conversion**
  - **need a check plot which will be used to overlay the final result**

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The next method of acquiring data is a method called digitizing. This is one of the common methods used to capture data from hardcopy maps into digital computer format. Three methods are identified. Manual digitizing is the use of a digitizing table which is connected to a computer that utilizes the digitizing table through its application software. Hardcopy maps are placed onto the table, and then ground coordinates are registered using the table and the application software. On

registered, then the points, line and area features are traced on the table using a digitizing puck/mouse. The traced features are consequently shown on the computer monitor and stored using the application software. The second method of digitizing is using a scanned which scans the hardcopy maps. The scanned maps are stored in the computer and then processed to get the real world coordinates of the points, lines, and polygons. The third method of digitizing is called on-screen digitizing. This method used a scanned image which has ground coordinates in the image. Using such an image as a background the features are traced out using the computer mouse and monitor to capture the points, lines, and polygon features. Digitizing is a common method which was very popular when GIS was first introduced.

The conversion from coordinate data to pixel data is called **rasterization** while the conversion from pixel data to coordinate data is called **vectorization**. Further details into these methods will be discussed in lectures ahead.

Slide 5

## Scanning versus manual digitizing

- Scanners are more expensive than digitizers
- Scanning needs more sophisticated software, while all GIS software include some form of manual digitizing capability
- There are more steps in the scanning process
- Scanning requires less highly trained personnel
- Scanning process is 50 to 10 times faster than digitizing
- Scanning works best with maps that are clean, simple, and do not contain extraneous information, such as text or graphic symbols
- Scanning is most cost-effective for maps with a large number of irregular-shaped features (e.g. contour lines)
- Manual digitizing is more cost-effective when there are relatively few, while maps that have a lot of extraneous information, requires interpretation



This slide compares scanning versus manual digitizing. Scanning is the conversion of hardcopy data into pixel data sets. Which is better, digitizing or scanning?

The pros and cons identified on this slide are dependent upon the context in which the GIS application developed and the resources at hand. Therefore neither method is better than the other.

Slide 6

- **Photogrammetric methods**
  - **Conventional (analog)**
    - **Involves the use of large stereoplotters which are used to reconstruct the position of the aerial camera at the time photography in order to create a realistic 3D model to capture the points, lines, and polygons**
    - **output is hardcopy maps which require conversion to digital data format**
  - **Analytical**
    - **Involves the use of computer hardware and photogrammetric software which are used to reconstruct the position of the aerial camera at the time photography**
    - **analytical orientation which involved modern computers that helps to create a realistic 3D model to capture the points, lines, and polygons**
    - **digital data stored directly into GIS database in the coordinate (vector) format**

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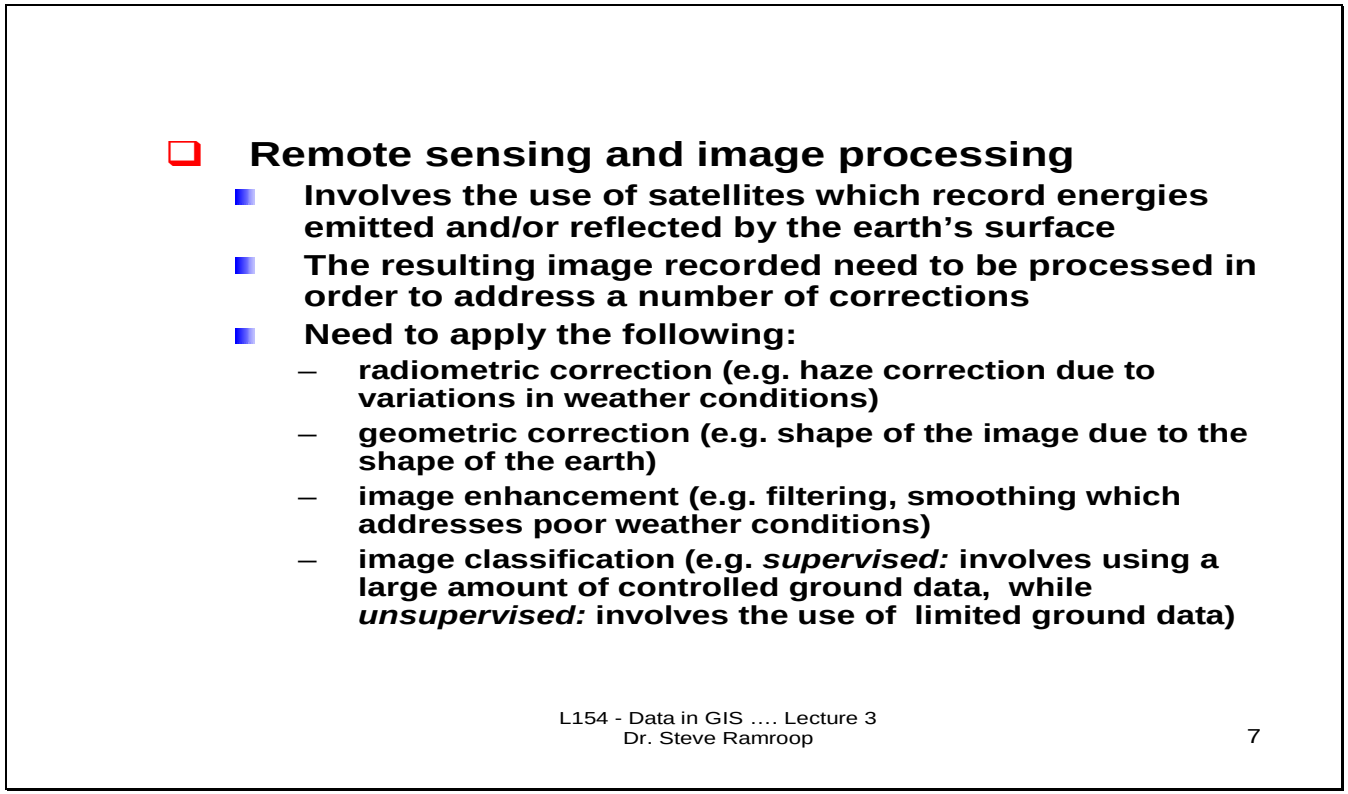
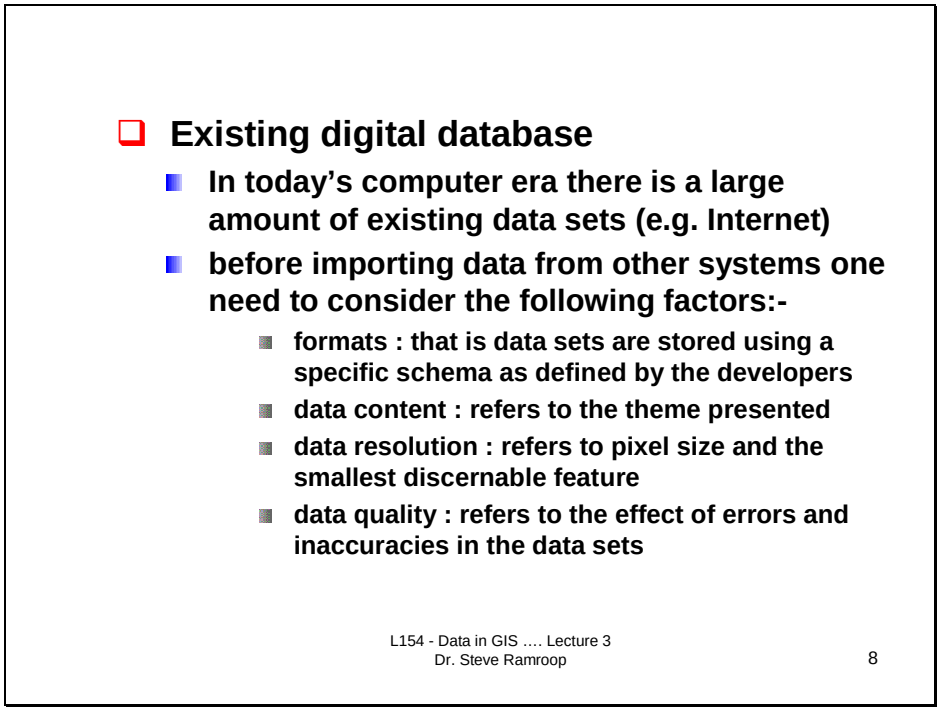
This third data acquisition method is through the use of aerial photos. There are two methods used to extract data from aerial photos which are analog and analytical methods. This slide gives a brief, yet self explanatory description of each method.

Slide 7



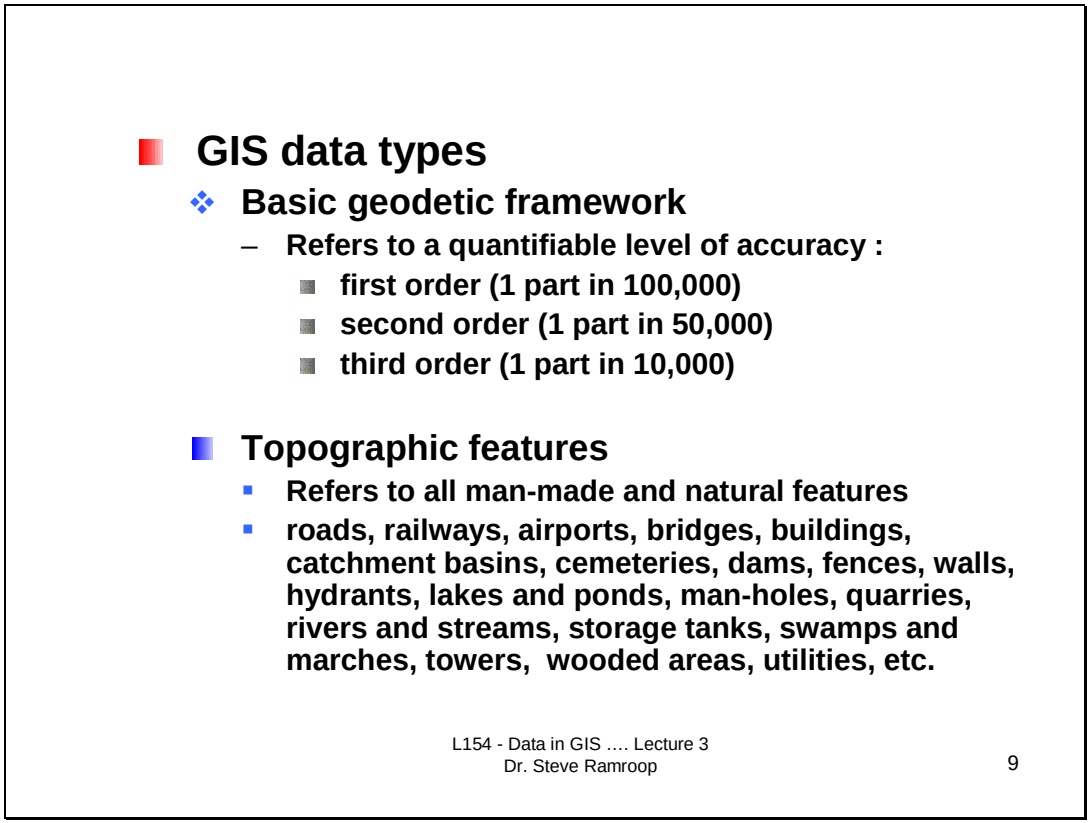

The fourth data acquisition method is data obtained from the satellites. The data sets from satellites are images which require post processing. Four of the post processing procedures are identified on this slide. Note that when data is taken out from satellites the spherical nature of the earth's surface introduces various errors associated with the image, and in addition other corrections need to be applied.

Slide 8



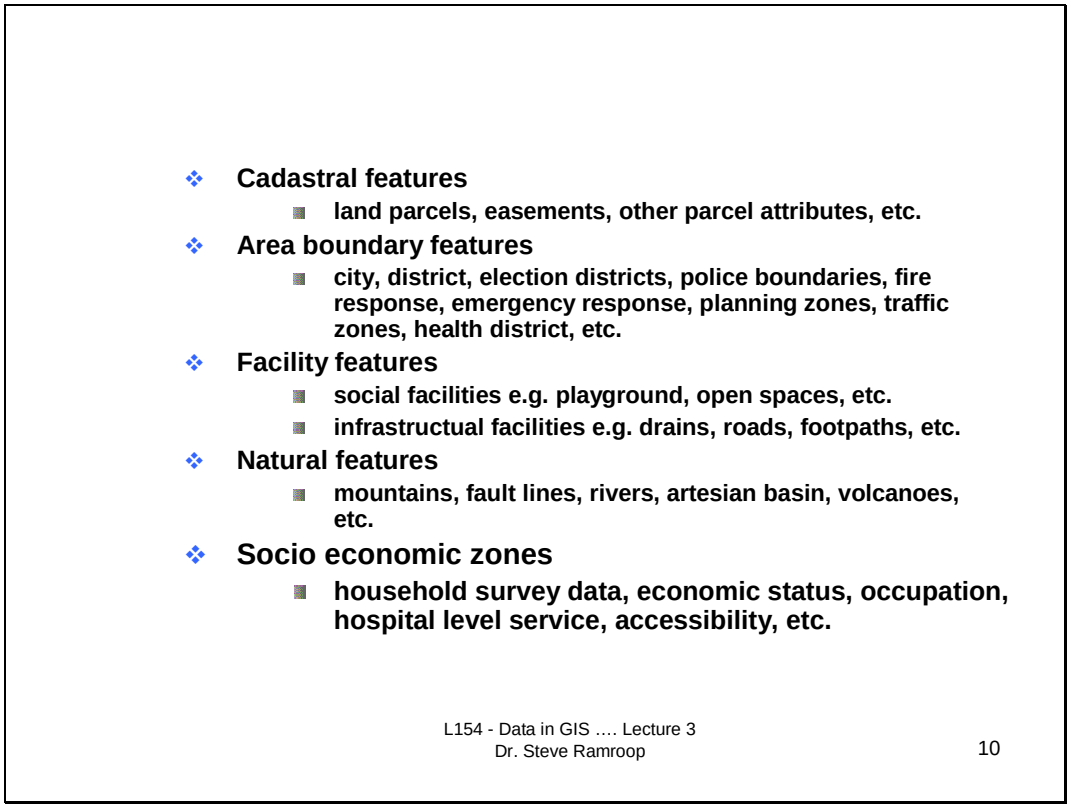

The forth data acquisition method is through existing digital databases. This is common in today's information technology (IT) world. There is a recognizable large amount of existing data sets stored and managed by autonomous organizations and are made available via the Internet. The reality is that these organizations are making their data sets available (with certain contractual agreements). Their data sets are varied in terms of the format, data content, resolution, and quality. Before data sets are used in any application development, the metadata of all data sets which will be used in the application must be considered because the final GIS end result will be influenced by the metadata.

Slide 9




This slide gives some examples of possible GIS data types. This is just a sample of possible data sets which can be used in most GIS application if available, and suitable for the intended GIS application. The Basic geodetic framework will define the coordinate system for each data set. The topographic features are additional information which can be added as data layers into the GIS application for further enhancement.

Slide 10




This slide shows a continuation of some other data sets which can be collected or acquired for the GIS application. This list is exhaustive and it all depends upon the intended GIS application.

Slide 11

# … The End …