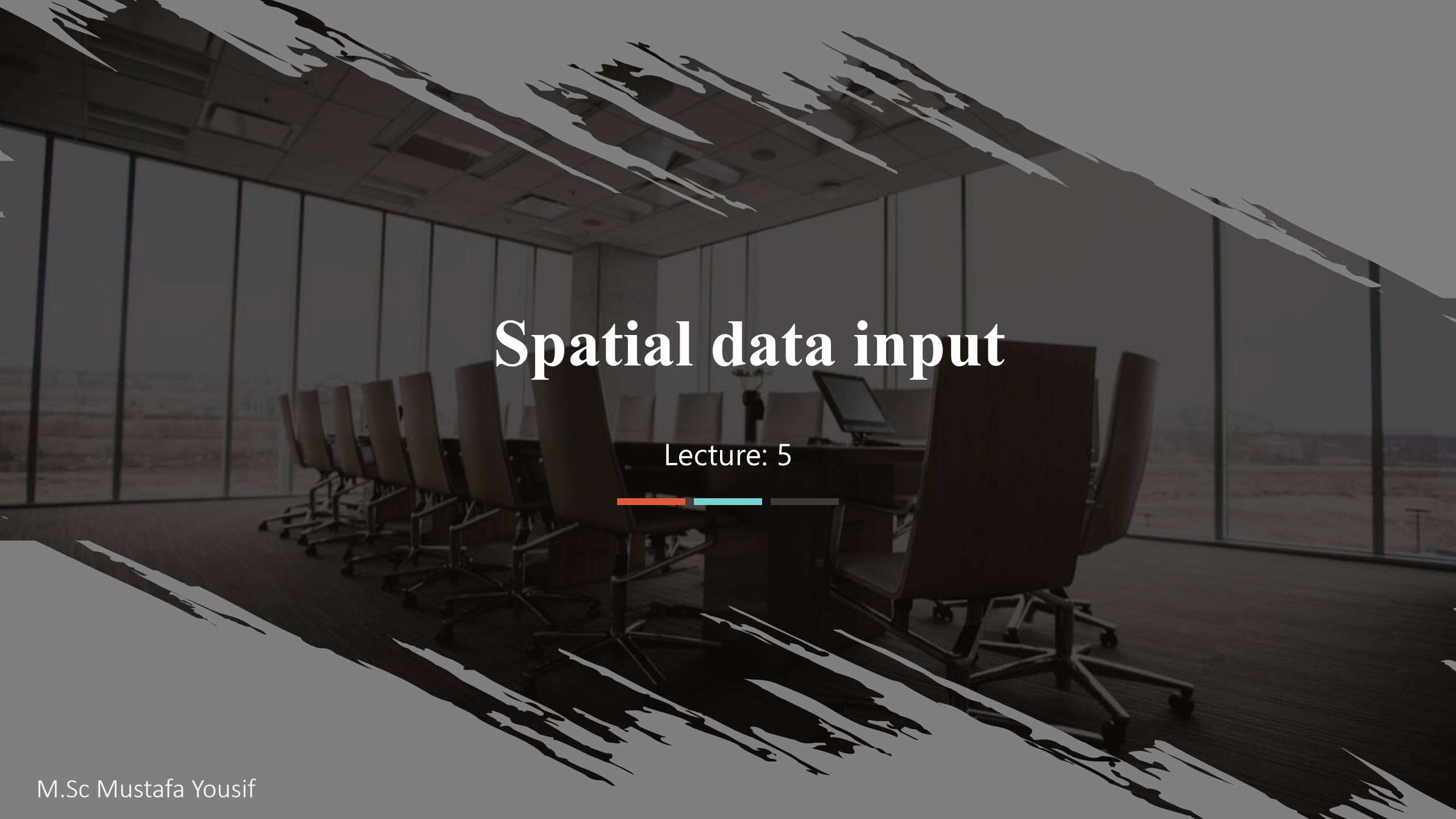
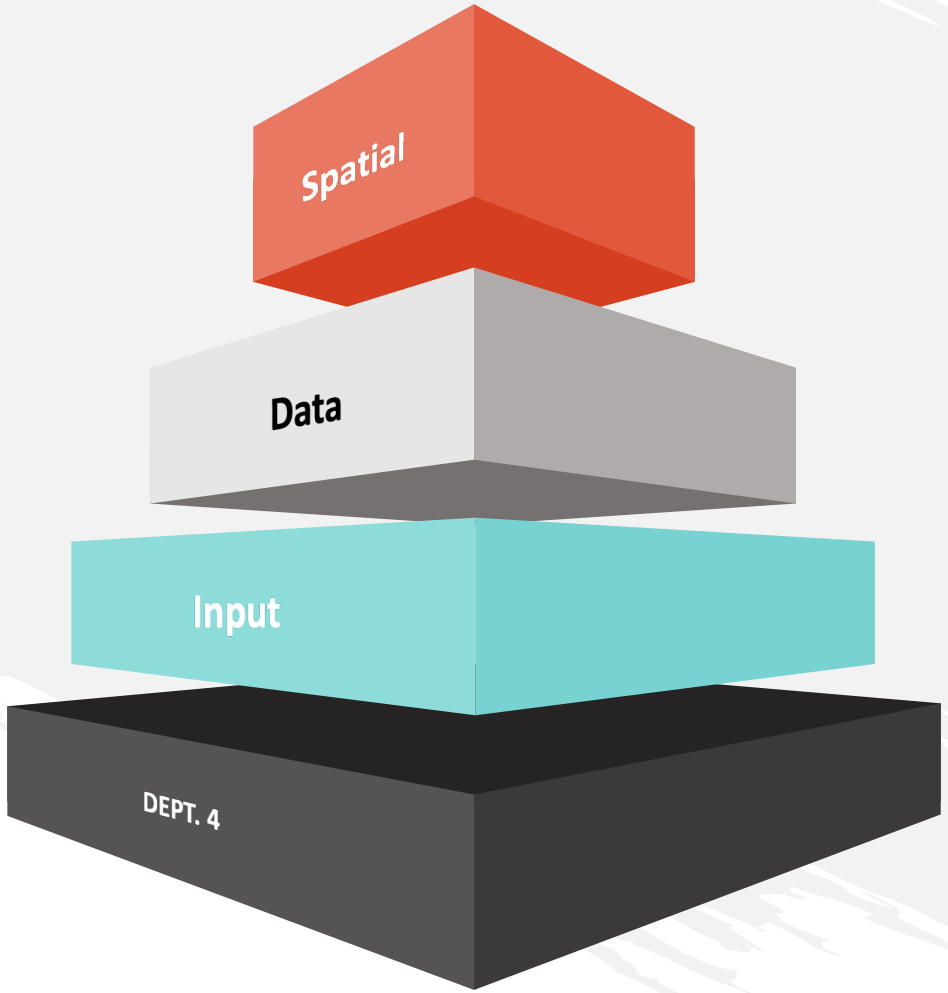


Spatial data input

Lecture: 5

M.Sc Mustafa Yousif

Spatial data input



is the procedure of encoding data into a computer-readable form and writing the data to the GIS data base. There are two types of data to be entered in a GIS - spatial (geographic location of features) and non-spatial (descriptive or numeric information about features).

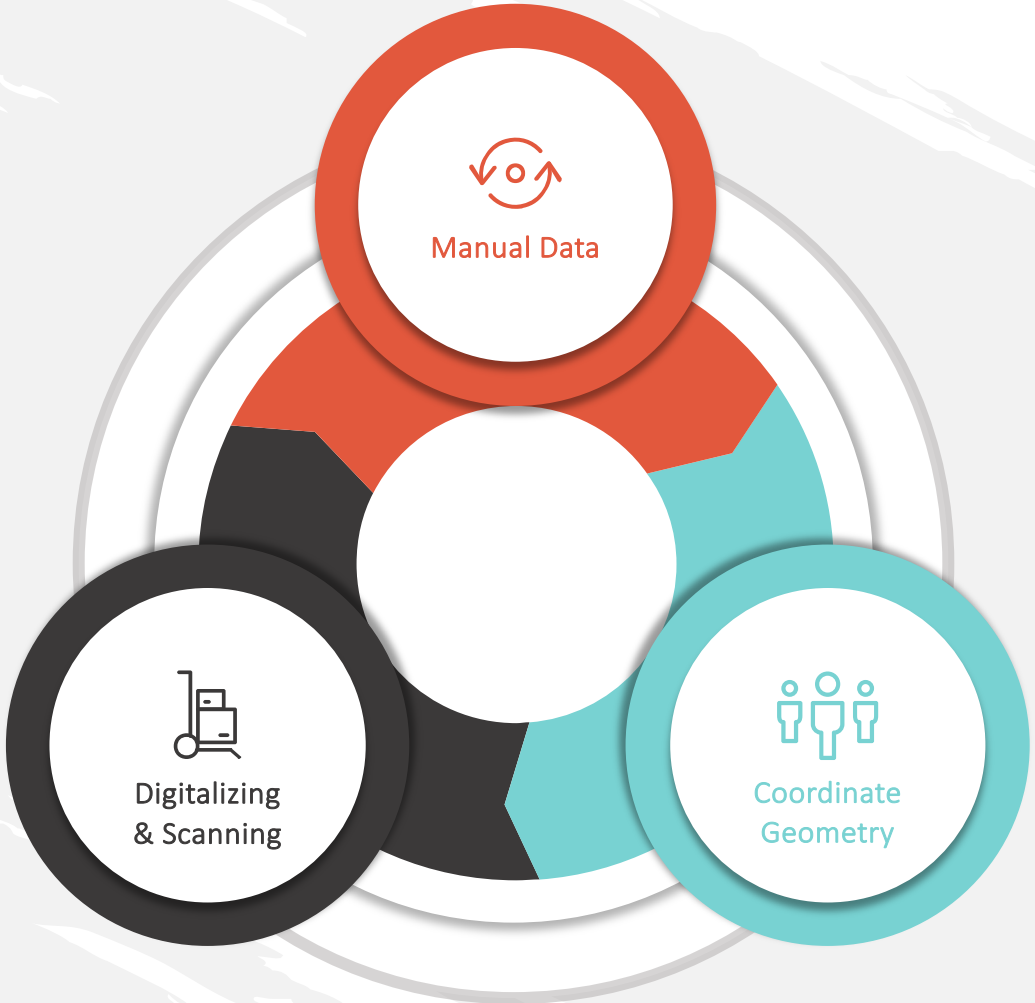
Data Input In GIS

There are three types of Data input:

1- Manual Data Entry

2- Digitalization & Scanning

3- Coordinate Geometry Method

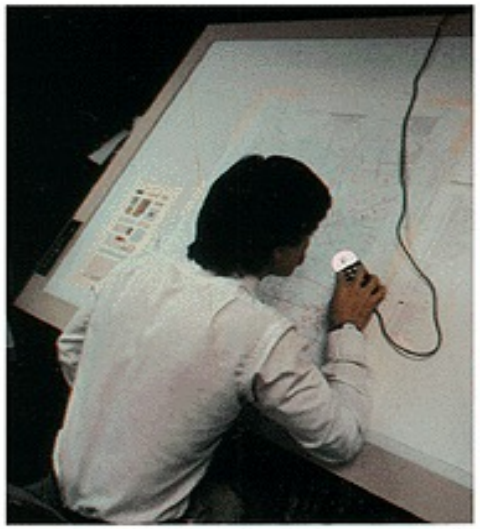


Manual Data Entry

- Manual data entry can bring into GIS either collected or measured data.
- These data exist as simple text files or binary files.
- Text files should have at least two columns with X and Y coordinates.
- These columns allow georeferencing of the file i.e. association of it with specific geographic coordinate system.
- Binary files are usually a product of the software package associated with measuring device (for example files from Global Positioning System data collection).
- They also have X and Y data, associated with description of the collected features, but in encoded format that could be read by special software.

Digitization & Scanning

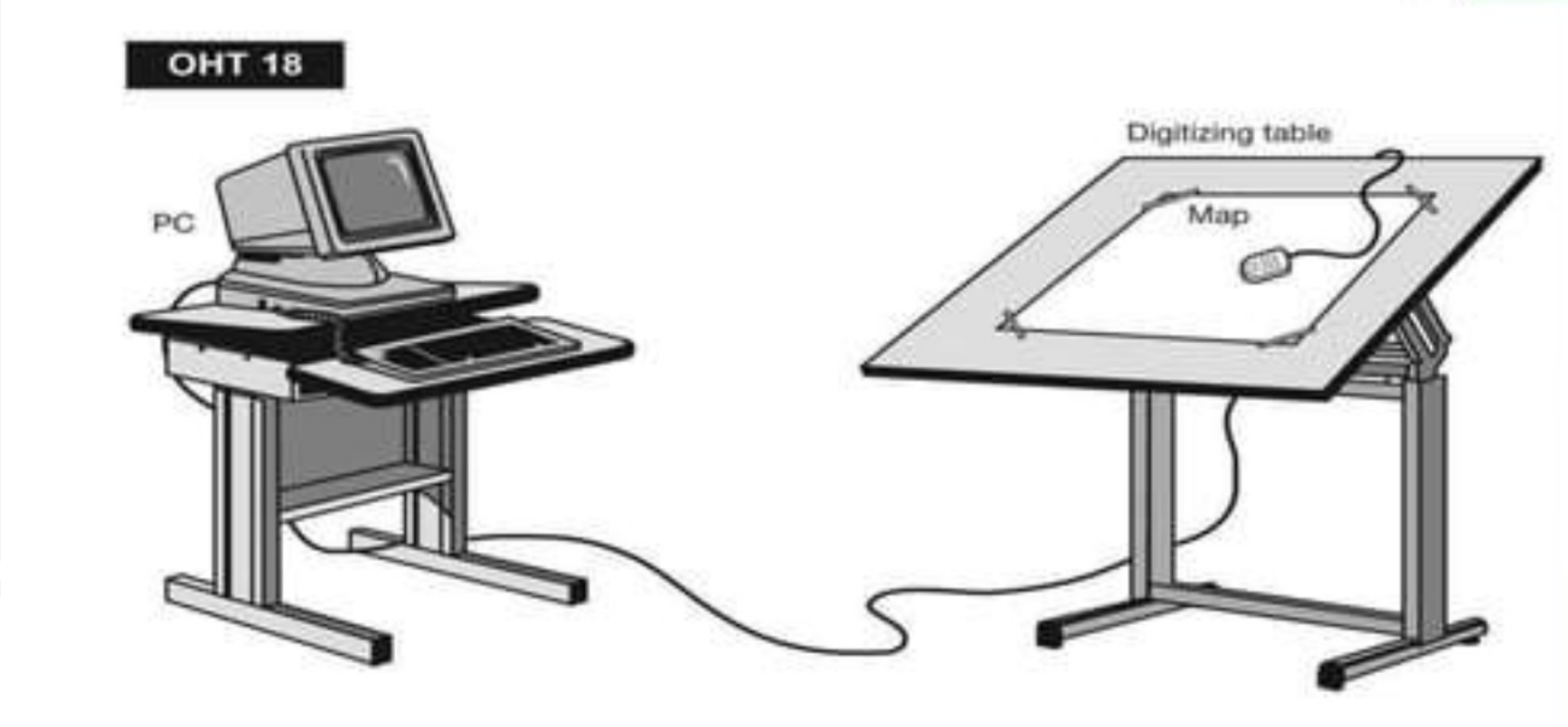
- Digitizing in GIS is the process of converting geographic data either from a hardcopy or a scanned image into vector data by tracing the features. During the digitizing process, features from the traced map or image are captured as coordinates in either point, line, or polygon format.
- Digitizing can be manual (using digitizing tablet) or automatic (using scanner).



Digitization & Scanning

- The difference between two methods is that digitizing tablet allows to do georeferencing during the digitizing process, while scanning require georeferencing later, after digital file (usually TIFF, GIF or JPEG image) has been created.
- Another difference between methods is speed and accuracy of the data processing.
- Apparent slowness of the work on digitizing tablet compensates often for the amount of editing after scanning process.

Digitization & Scanning



Digitization & Scanning

- At the same time good scanning allows automatic layer separation (for example, separation of red-colored roads from brown-colored contour lines), while digitizing of the map on a tablet requires manual creation of separate themes.
- In this case the condition of the original hardcopy is very important.
- Special kind of scanned data is remote sensing image, taken either by satellite camera, digital camera or video camera.

Digitization & Scanning

There are several types of digitizing methods. Manual digitizing involves tracing geographic features from an external digitizing tablet using a puck (a type of mouse specialized for tracing and capturing geographic features from the tablet). Heads up digitizing (also referred to as on-screen digitizing) is the method of tracing geographic features from another dataset (usually an aerial, satellite image, or scanned image of a map) directly on the computer screen. Automated digitizing involves using image processing software that contains pattern recognition technology to generated vectors.

Digitization & Scanning

Since most common methods of digitizing involve the interpretation of geographic features via the human hand, there are several types of errors that can occur

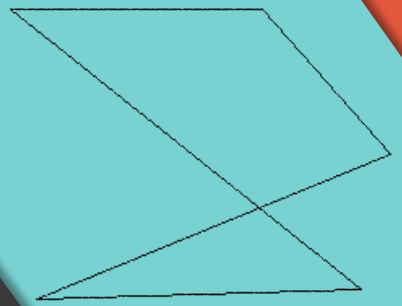
during the course of capturing the data. The type of error that occurs when the feature is not captured properly is called a positional error, as opposed to attribute errors where information about the feature capture is inaccurate or false.

Digitization Errors

Dangles or Dangling Nodes

Dangles or dangling nodes are lines that are not connected but should be. With dangling nodes, gaps occur in the linework where the two lines should be connected.

Switchbacks, Knots, and Loops



In the case of switchbacks, extra vertices are introduced and the line ends up with a bend in it. With knots and loops, the line folds back onto itself, creating small polygon like geometry known as weird polygons

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Over shoots and Under shoots

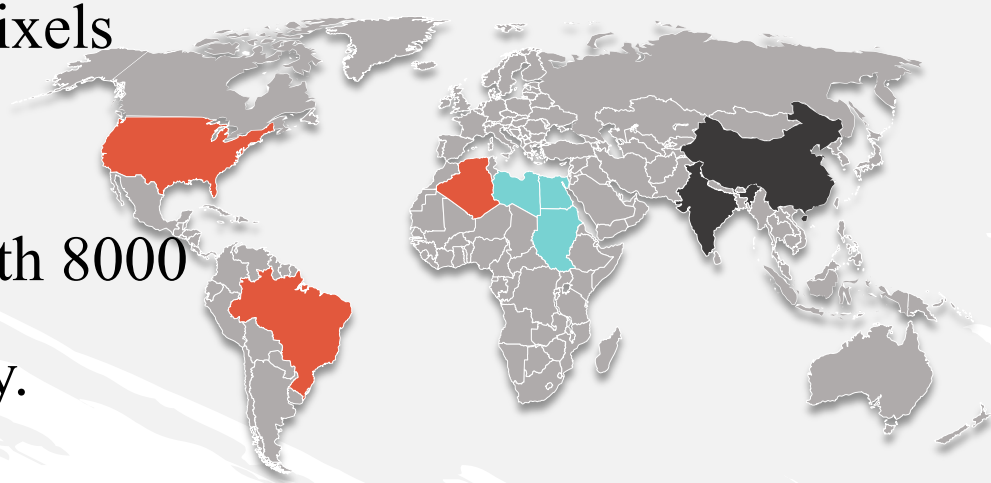
Similar to dangles, overshoots and undershoots happen when the line digitized doesn't connect properly with the neighboring line it should intersect with.

Scanner

- Scanning coverts paper maps into digital format by capturing features as individual cells, or pixels, producing an automated image.
- Maps are generally considered the backbone of any GIS activity.
- But many a time paper maps are not easily available in a form that can be readily used by the computers.
- Most of the paper maps had been prepared on the basis of old conventional surveys.
- New maps can be produced using improved technologies but this requires time as it increases the volume of work. Thus, we have to resort to the available maps.

Working of a Scanner

- The most important component inside a scanner is the scanner head which can move along the length of the scanner.
- The scanner head contains either a charged-couple device (CCD) sensor or a contact image (CIS) sensor.
- ACCD consists of a number of photosensitive cells or pixels packed together on a chip.
- The most advanced large format scanners use CCD's with 8000 pixels per chip for providing a very good image quality.



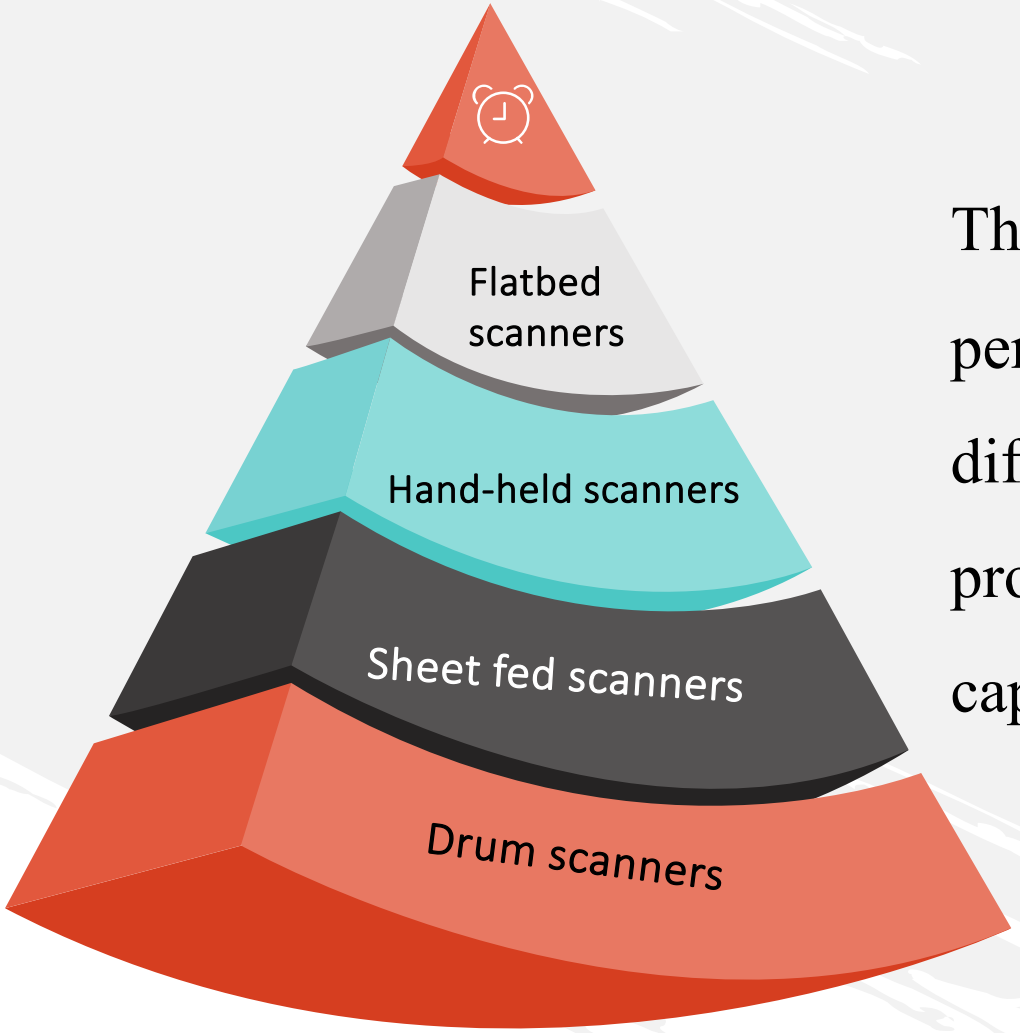
Working of a Scanner

- While scanning a bright white light from the scanner strikes the image to be scanned and is reflected onto the photosensitive surface of the sensor placed on the scanner head.
- Each pixel transfers a gray tone value (values given to the different shades of black in the image ranging from 0 (black) -255 (white) i.e. 256 values to the scan board (software).
- The software interprets the value in terms of 0 (Black) or 1 (white), thereby, forming a monochrome image of the scanned portion.
- As the head moves ahead, it scans the image in tiny strips and the sensor continues to store the information in a sequential fashion. the software running the scanner pierces together the information from the sensor into a digital form of the image. This type of scanning is known as one pass scanning.

Working of a Scanner

- Scanning a color image is different in which the scanner head has to scan the same image for three different colors i.e. red, green, blue.
- In older color scanners, this was accomplished by scanning the same area three times over for the three different colors. This type of scanner is known as three-pass scanner.
- However, most of the color scanners now scan in one pass scanning all the three colors in one go by using color filters.
- In principle, a color CCD works in the same way as a monochrome CCD. But in this each color is constructed by mixing red, green and blue. Thus, a 24-bit RGB CCD presents each pixel by 24 bits of information. Usually, a scanner using these three colors (in full 24 RGB mode) can create up to 16.8 million colors.

The Types Of The Scanners



There are several different types of scanners performing the same job but handling the job differently using different technologies and producing results depending on their varying capabilities.

Drum scanners

The drum scanners which are mostly used by the printing professionals. In this type of scanner, the image or the document is placed on a glass cylinder that rotates at very high speeds around a centrally located sensor containing photo-multiplier tube instead of a CCD to scan. Before to the advances in the field of sheet fed scanners, the drum scanners were extensively used for scanning maps and other documents.

Coordinate Geometry Method

- This technique is also called as COGO method.
- The survey measurements such as bearings and lengths are taken as input and entered into GIS using keyboard.
- Coordinates of objects and features are calculated by the GIS.
- This input technique produces highly accurate results and is useful in preparing cadastral maps.
- It takes lot of time, manpower and cost to produce the maps compared with normal digitizing process.


THANK YOU
Do you hava any question?