



# Week 4,Lec4



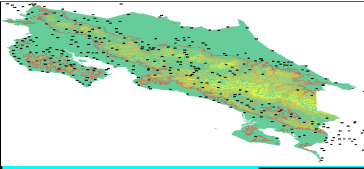
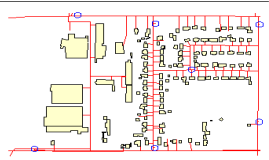


# Spatial Database

- **GIS is Spatial Data? Why & How**
- **Spatial Data issues**
  - Structure
  - Availability
  - Accuracy
- **Data is the most expensive part of GIS**
- **Data cost will be reduced once start benefiting and using the system**
- **Two types of GIS Data**
  - Spatial Data
  - Attribute Data

# Types of data

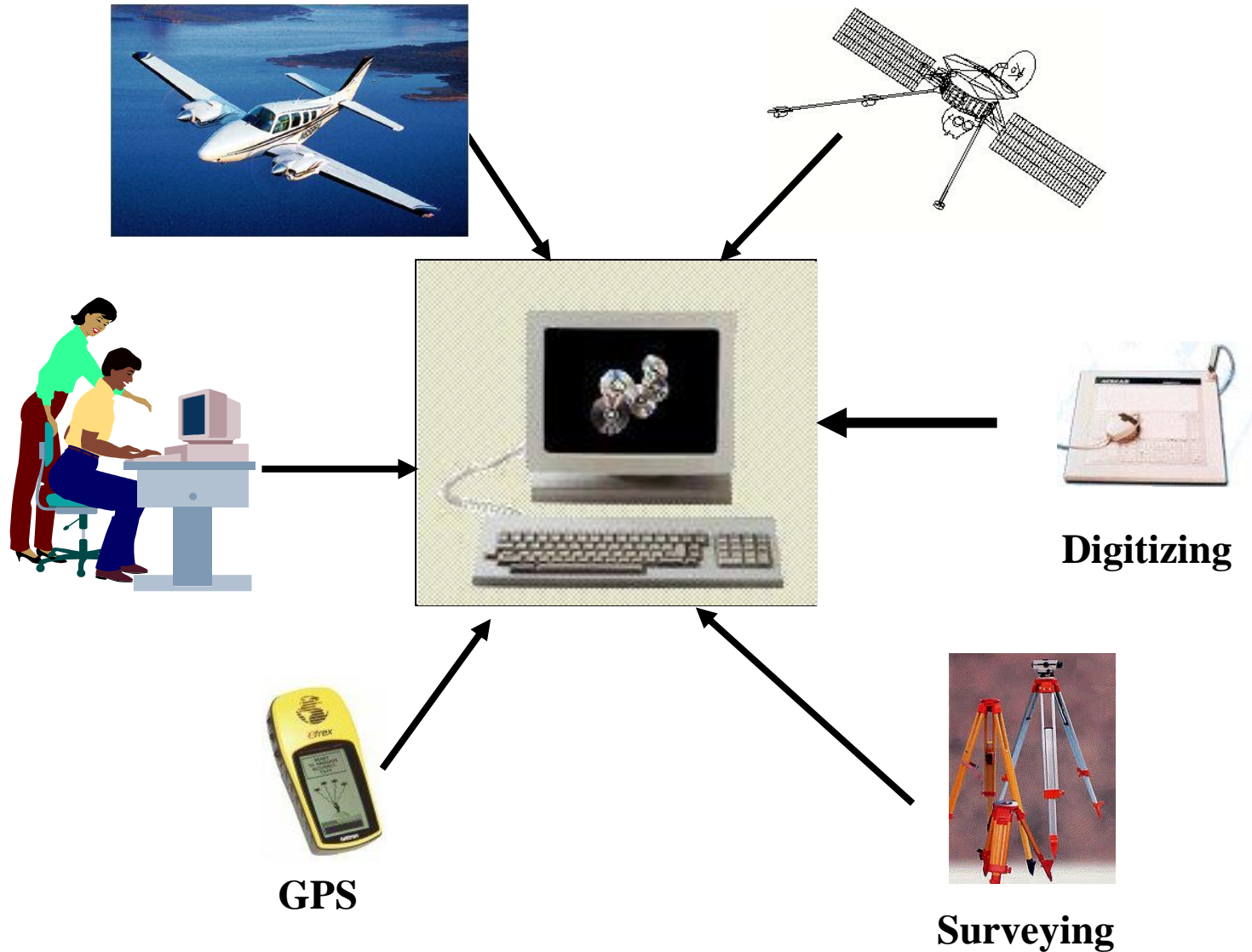
## Spatial

## Non-Spatial

	Maps	Schematic diagrams	
	Images	Oblique photographs	
Videography		Films	
Postcodes/ZIP codes KT1 2EE RH8 9AA SW1P 3AD		Financial statements £12,000 23.45 56789 £23,456 12.45 23456 £45,987 29.57 87634	

- Within an information system many different types of data may be used, each of which has different characteristics.
- The data may be spatial in a direct sense in that it describes a single location, or indirectly, in that the location is inferred.
- The data may also be represented in a graphic, or non-graphic form.
- Maps are the main source of data for GIS and the traditions of cartography are fundamentally important to the way GIS's operate. It is important to remember, however, that maps are not the *only* source of spatial data

# Data Sources



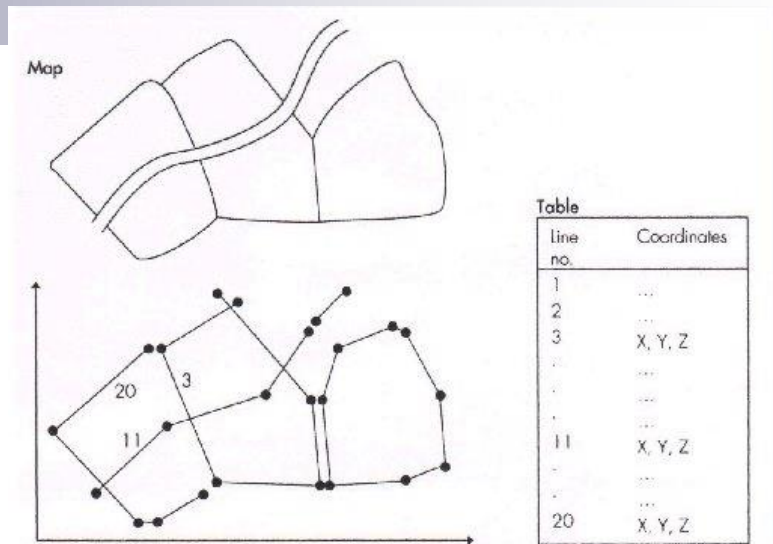


# Data Representation in GIS

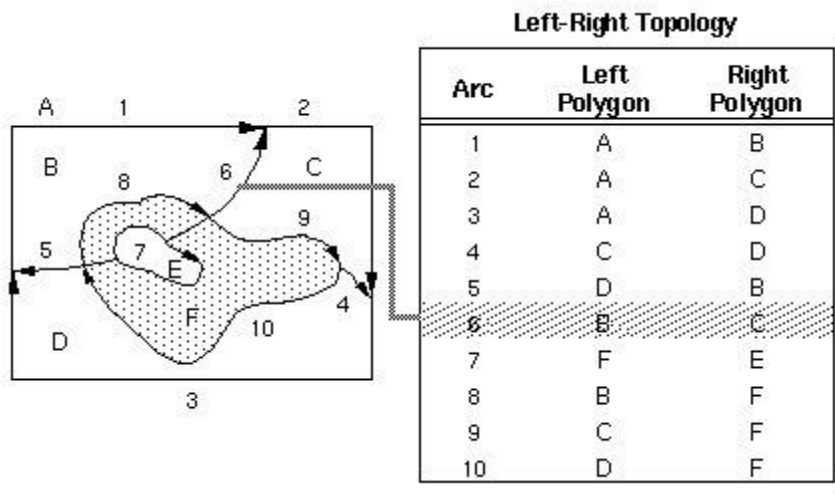
- Vector Data Model
- Raster Data Model
- TIN Mode
- Object Oriented

# GIS Structure

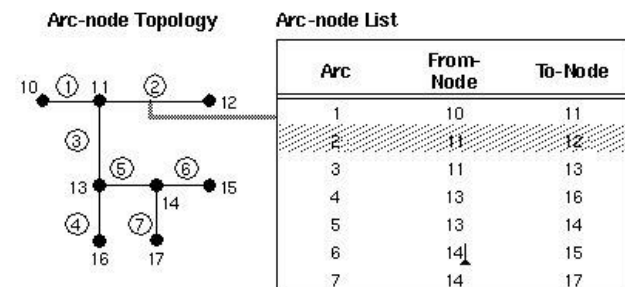
- Geo-Referenced



- Spatial as well as aspatial data



- Spatial relationship
- Spatial Analysis and Modeling



# GIS Data Elements & Characteristics



## Data Characteristics

**Space** – feature locations

**Attribute** – feature attributes, qualities & characteristics of geographic places.

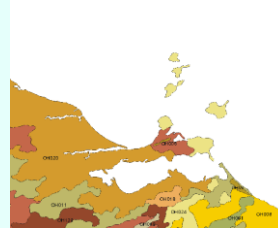
**Relationships Between Features**

**Time** – additional dimension

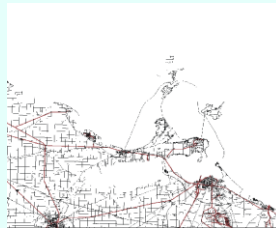
## Vector



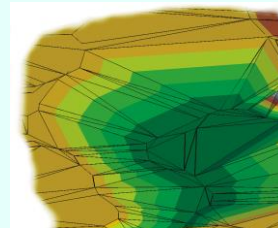
Point



Polygon



Lines



Surface

## Raster



Image



Grid

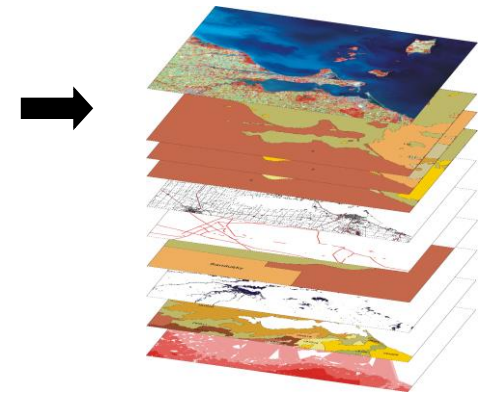
## Data Types

### Vector

- Based on mathematical function
- point, line, polygon, & surface

### Raster

- Data present on a fixed grid structure (matrix)
- image, grid



GIS Data Layers



# Data Characteristics

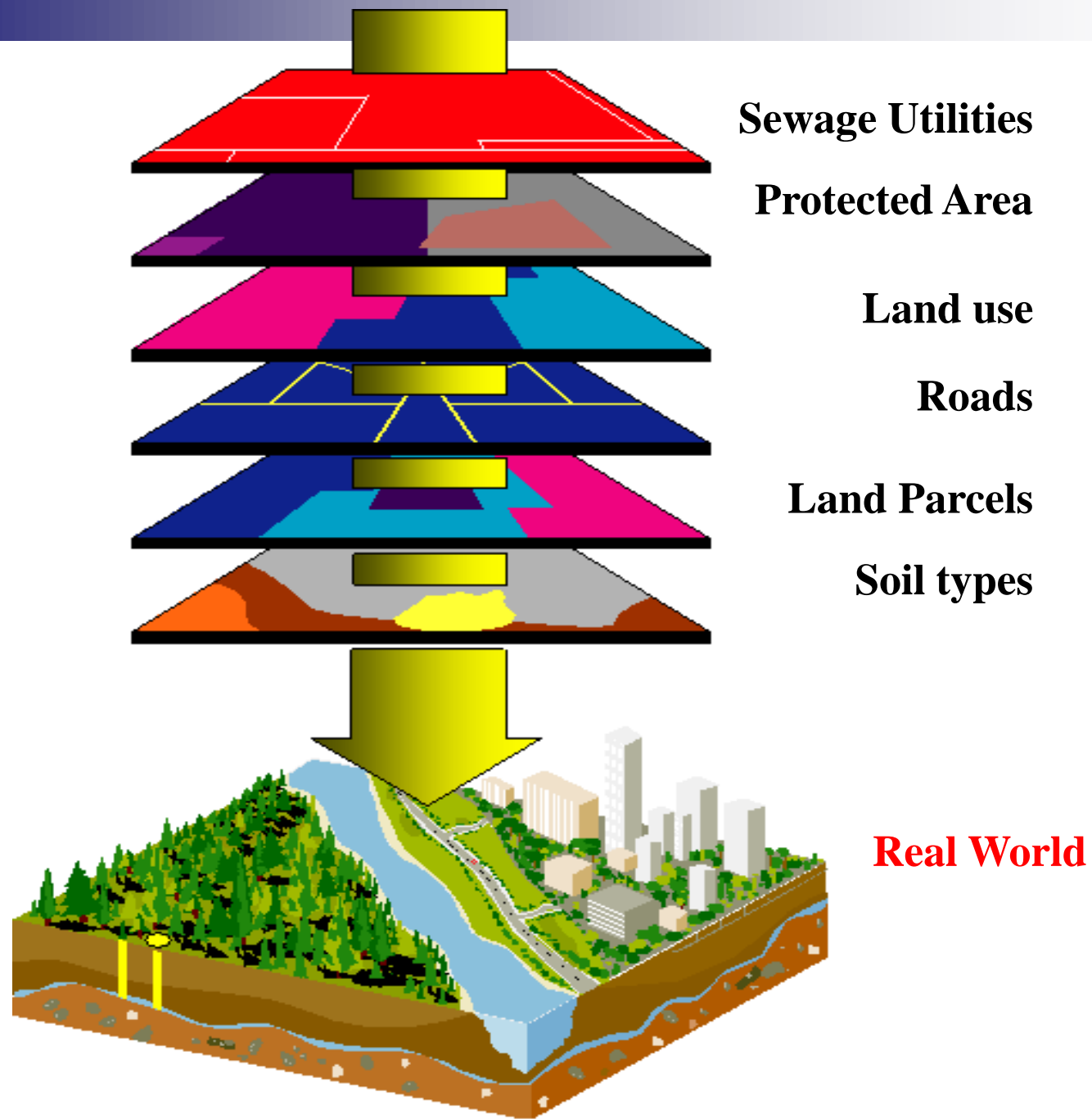
- *Space* – feature locations; all data are georeferenced
  - Ex.: lat/long, UTM, state plane
- *Attribute* – feature attributes, qualities & characteristics to geographic places
  - Ex.: elevation, soil moisture, temperature, land ownership, zoning
- *Relationships* between features
  - Ex.: overlay, connectivity, adjacency
- *Time* – additional dimension



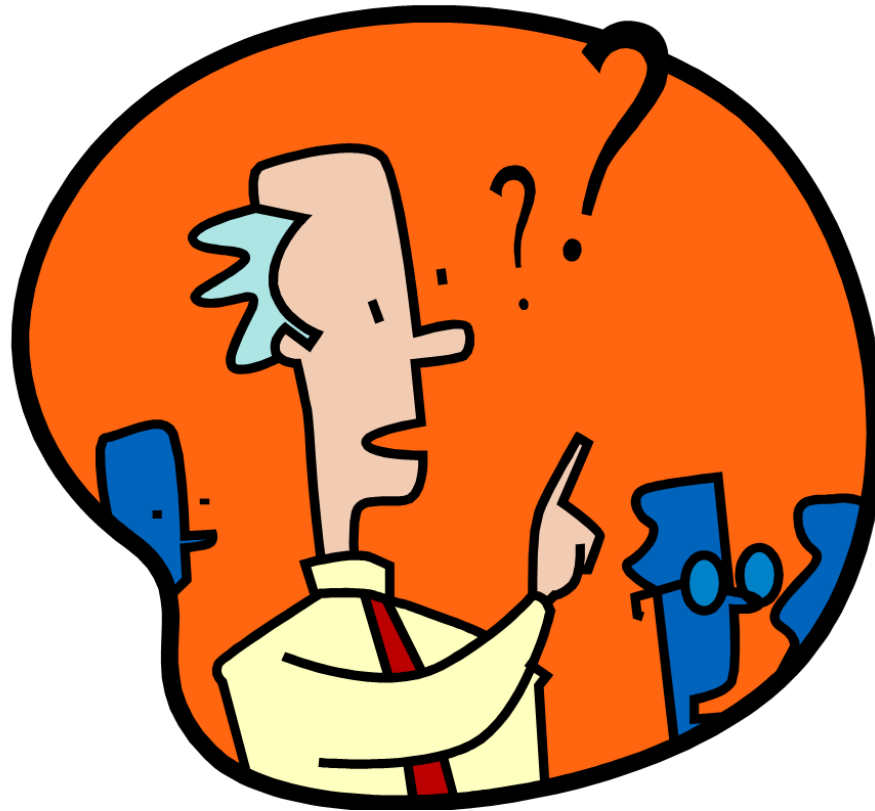


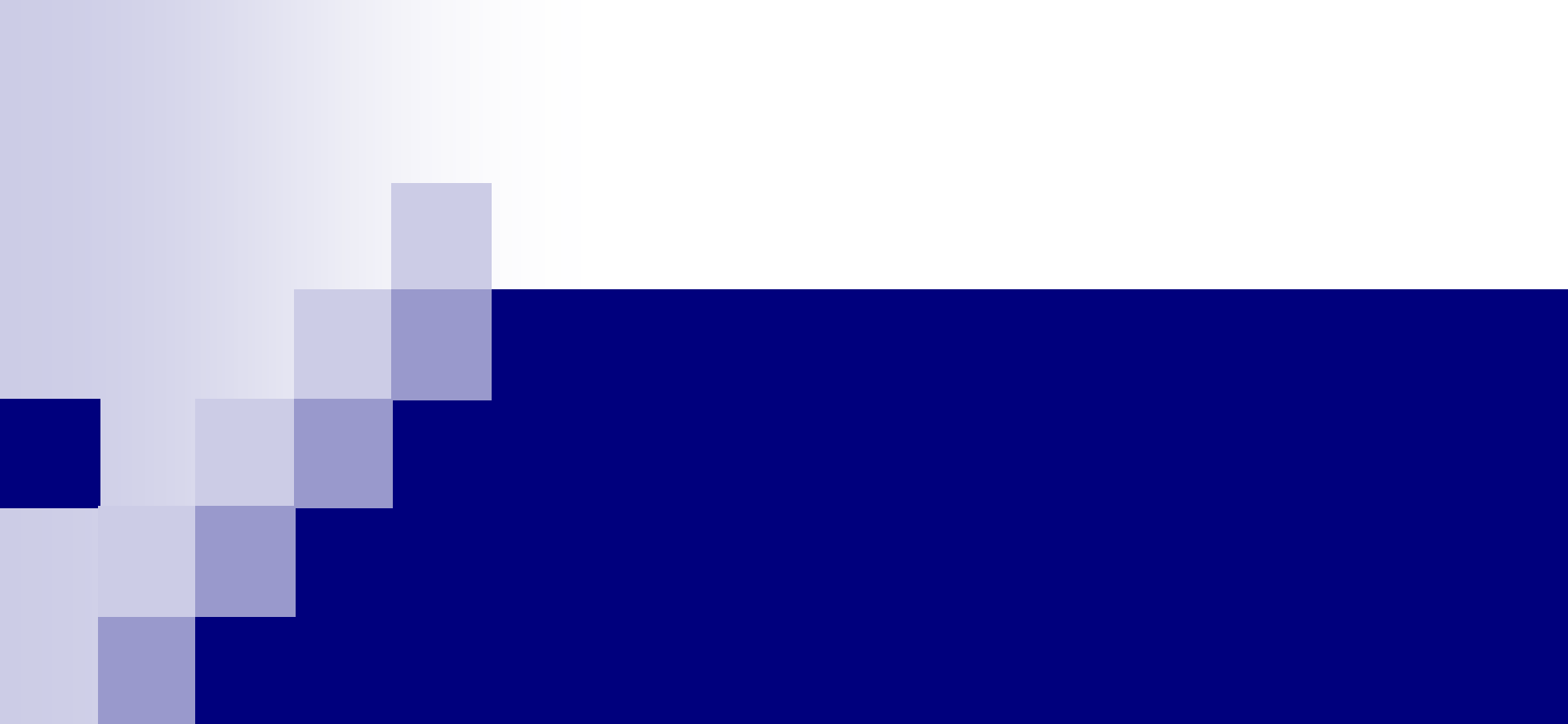
# Data Integration

- Data obtained from maps
- Satellite & aircraft images
- Video film from low-flying aircraft
- Statistical data from published tables
- Photographs
- CAD drawings
- Data from archives by the Internet or other networks



# Questions





Lec3 p2



# **Data Model: Raster Data Model**

Lec4



# Take home tasks

- A Brief abstract about your course project.
- Self study: chapter: mapping human body as a GIS perspective.



# **Lecture Contents**

- **Geographical Data Model**
- **Raster Data Model**
- **Spatial Representation**
- **Raster Data Coding**
- **Creating a Raster Model**
- **Discussions**



# **Geographical Data Models**

- **Vector Data Model**
- **Raster Data Model**
- **TIN Model**
- **Object Oriented**





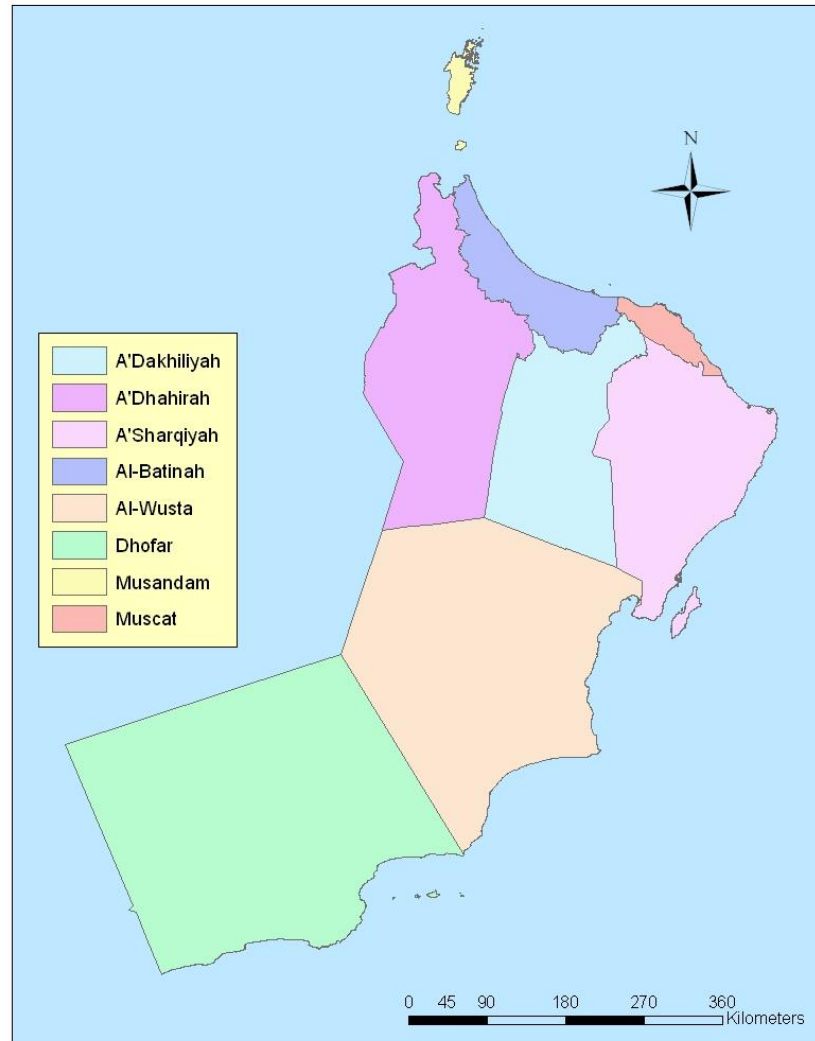
# **Raster Data Model**

- **Earlier GIS was based on Raster Data Model (CGIS & SYMAP)**
- **Raster Data Model examples**
  - **Scanned Map**
  - **Remote Sensing Images**
  - **Aerial Photos**

# Remote Sensing Images (X-Tower)



# Scanned Map





# Aerial Photo

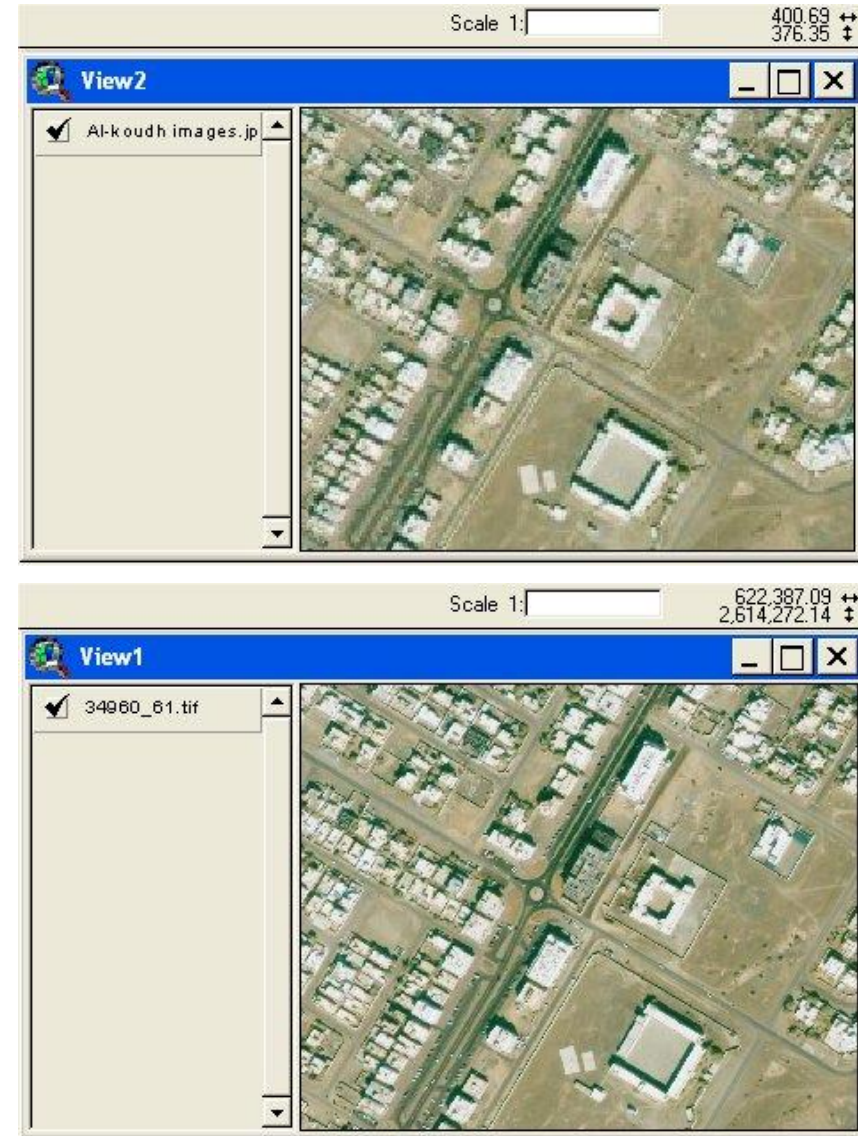


# **Raster Representation**

- **The idea of raster is based in pixels (Grid cells)**
- **How does it work?**
  - **Cellular organization**
    - **Divides space in a series of units**
    - **Each unit is generally similar in size to another**
    - **Grid cells is the most common raster representation**
    - **Features are divided into cellular arrays**

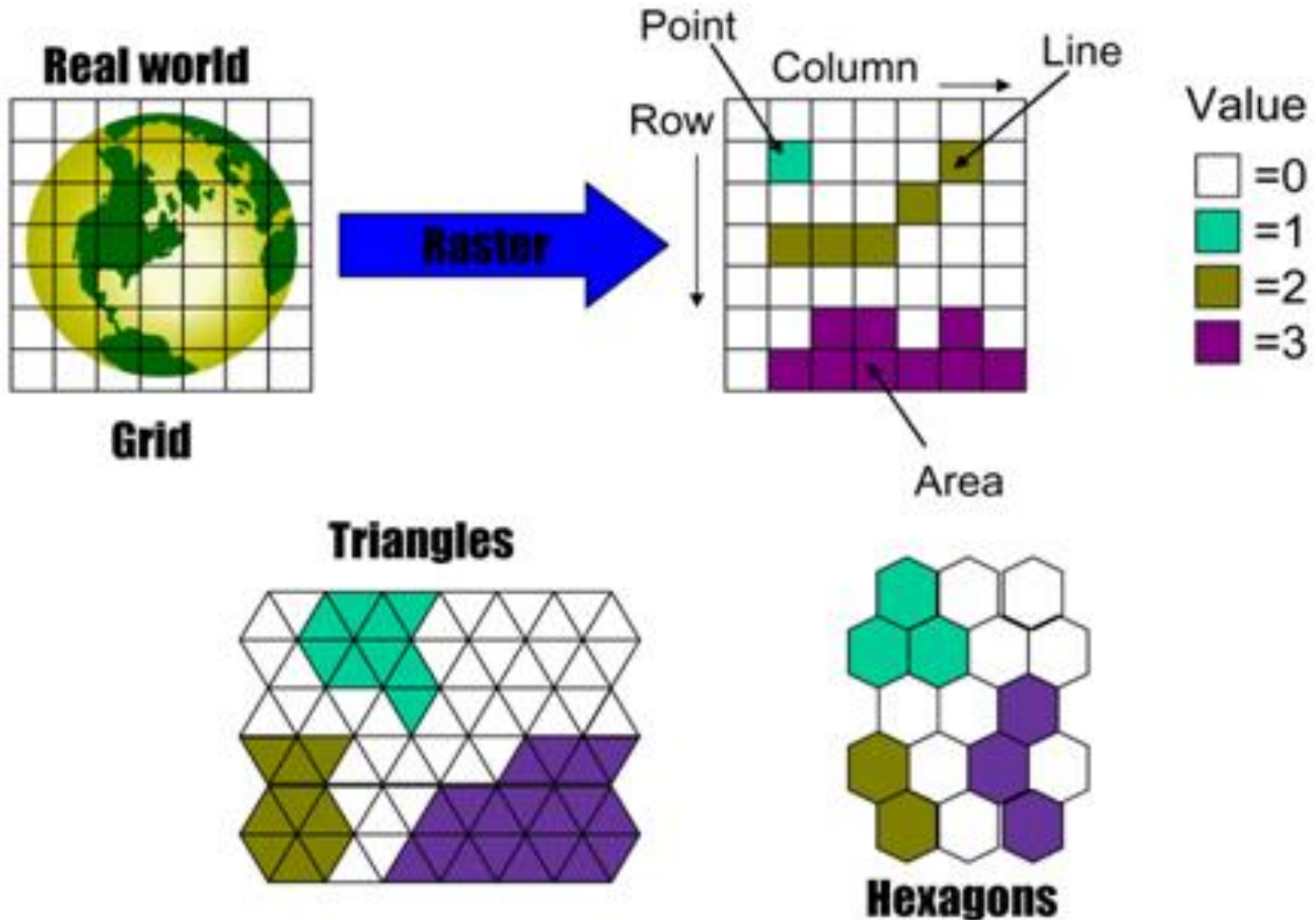
# Raster Representation

- Coordinate (X&Y) is assigned to each cell, as well as a value.
- JPEG, GIF, BMP, TIFF ... are raster formats





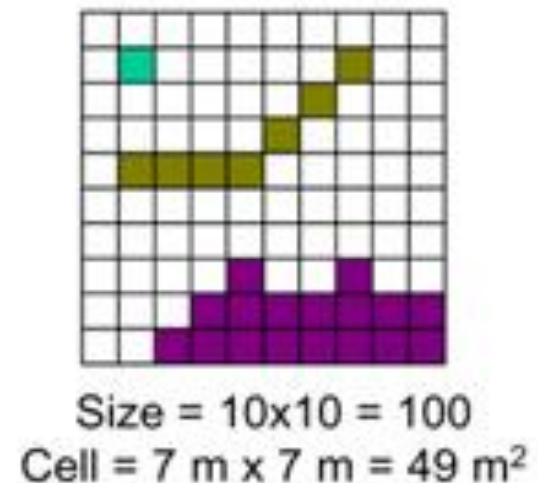
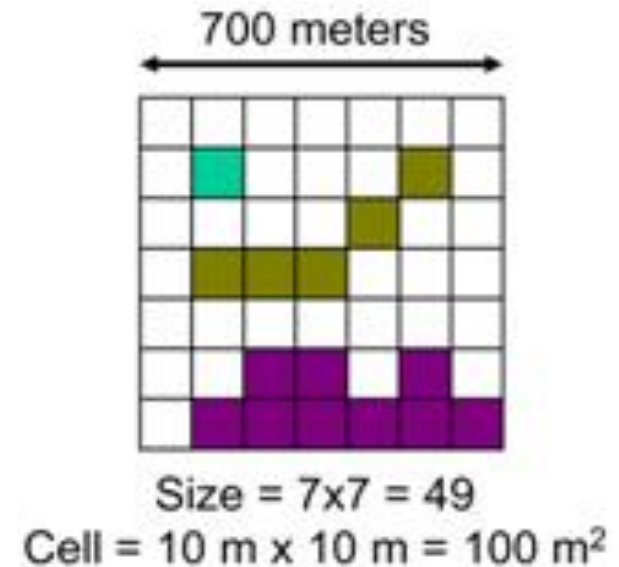
# Raster Representation



# Raster Representation

## ■ Advantages

- Easy to conceptualize
- Overlay operations (Analyses) are easy
- Less expensive
- Can be used in both GIS & RS





# Spatial Resolution

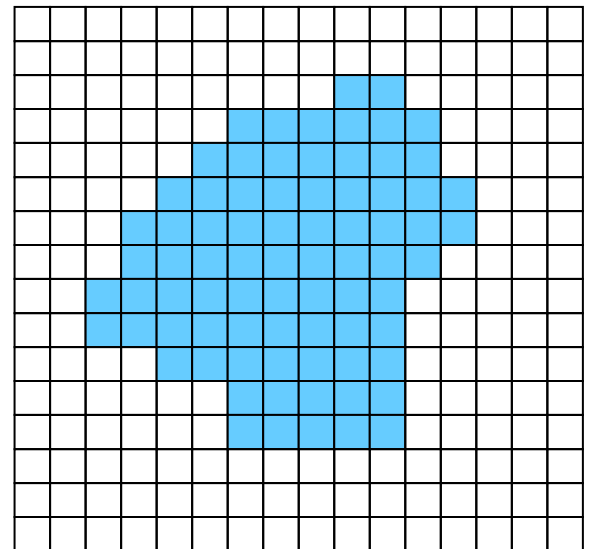
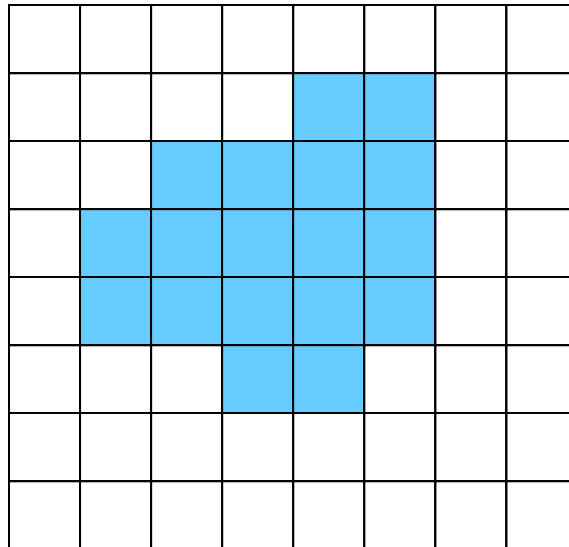
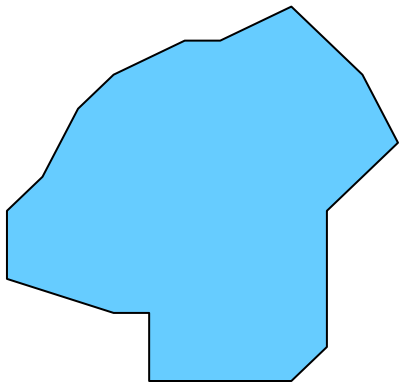
- The problem of resolution

- For a small grid:

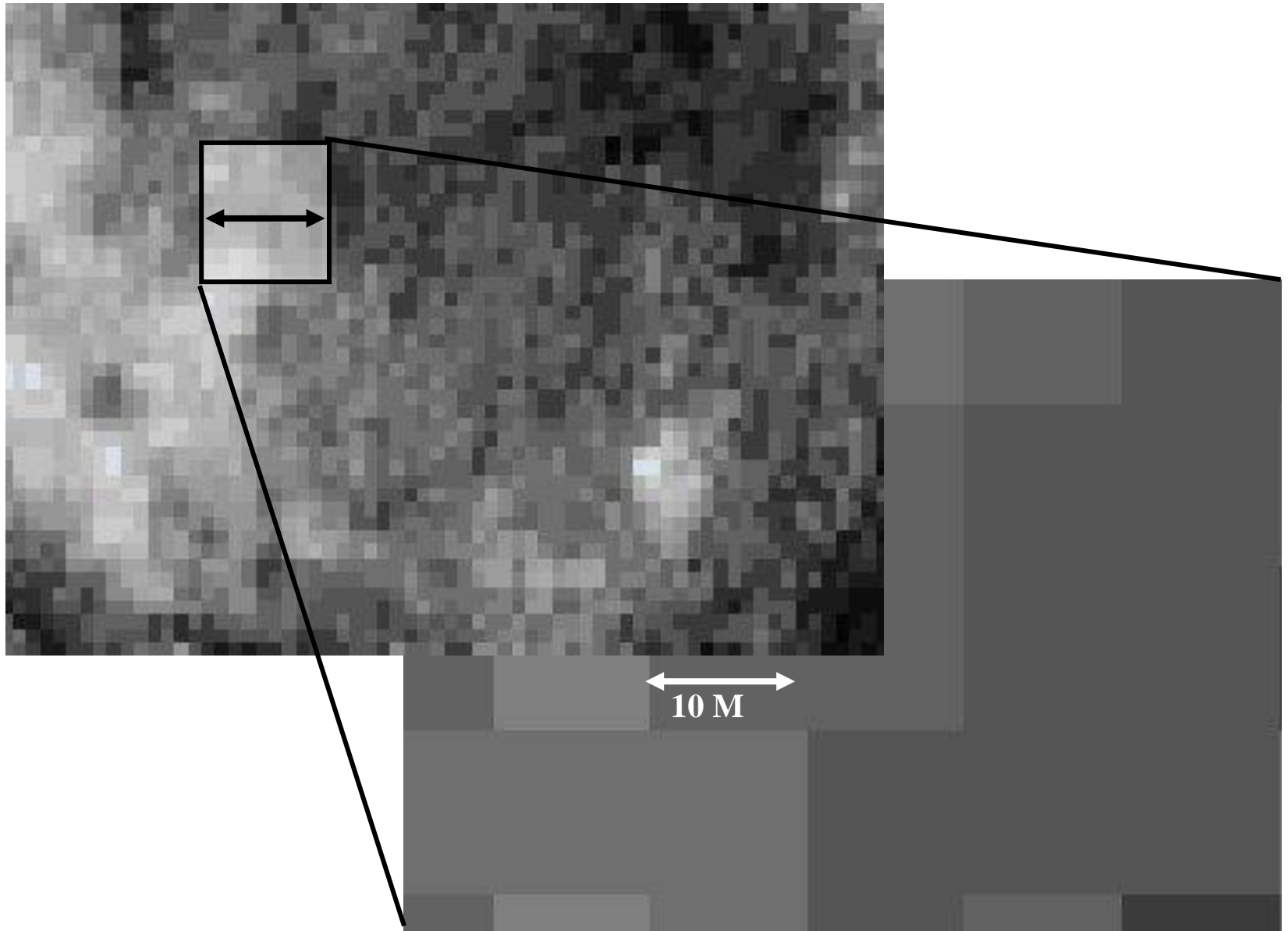
- Bad resolution but limited storage space

- For a large grid:

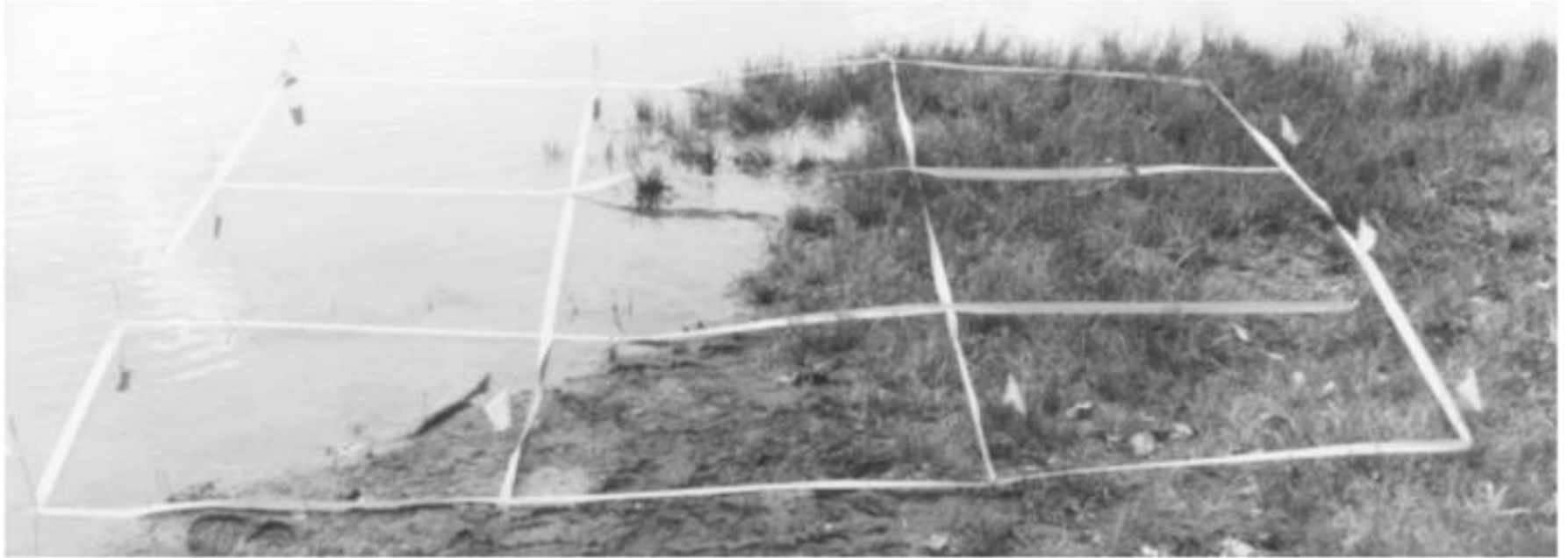
- Fine resolution but large storage space



# Spatial Resolution



# The Mixed Pixel Problem



**Water dominates**

W	W	G
W	W	G
W	W	G

**Winner takes all**

W	G	G
W	W	G
W	G	G

**Edges separate**

W	E	G
W	E	G
E	E	G



# **Raster Data Coding**

- **Chain Coding**
- **Run-Length Coding**
- **Block Coding**
- **Quadtree Coding**