Introduction to Geographic Information Systems

Part B

NPS Introduction to GIS: Lecture 1

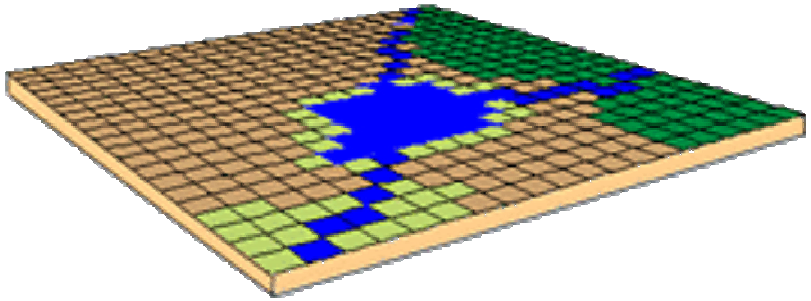
Based on NIMC and Other Sources

MODELLING AND STRUCTURING DATA

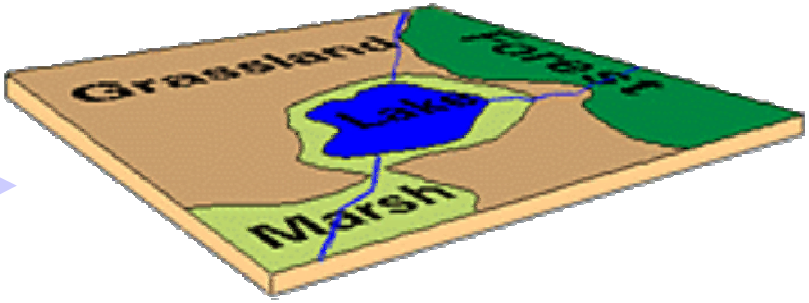
(How we represent features or spatial elements)

Representing Spatial Elements

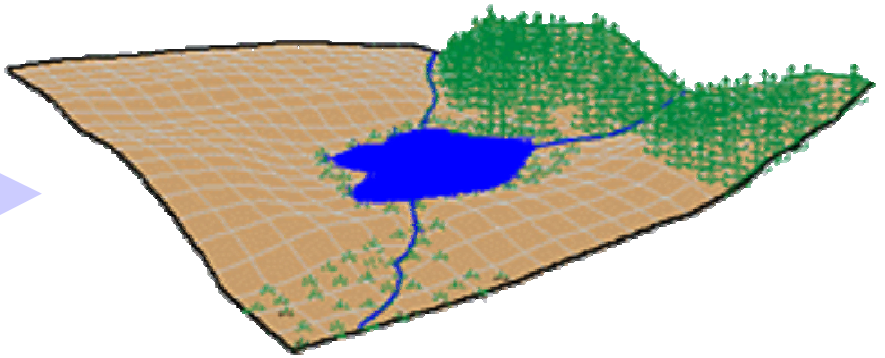
- RASTER



- VECTOR



- Real World



Representing Spatial Elements

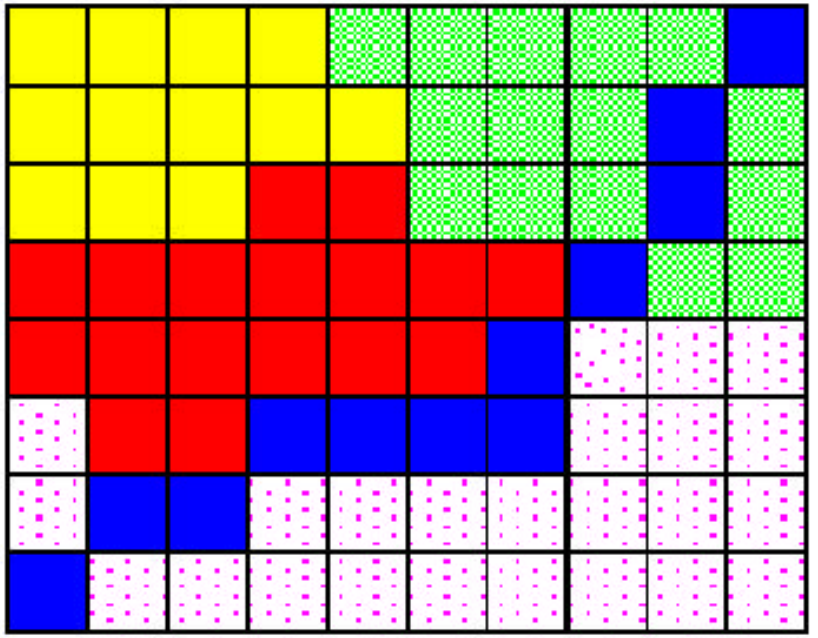
Raster

Stores images as rows and columns of numbers with a Digital Value/Number (DN) for each cell.

Units are usually represented as square grid cells that are uniform in size.

Data is classified as "*continuous* (such as in an image), or *thematic* (where each cell denotes a feature type.

Numerous data formats (TIFF, GIF, ERDAS.img etc)

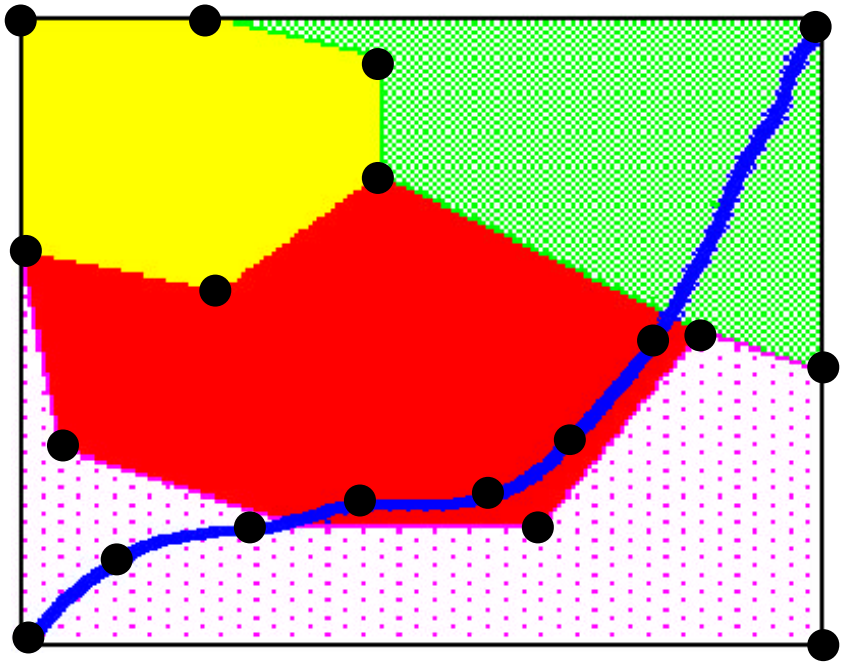


Representing Spatial Elements

Vector

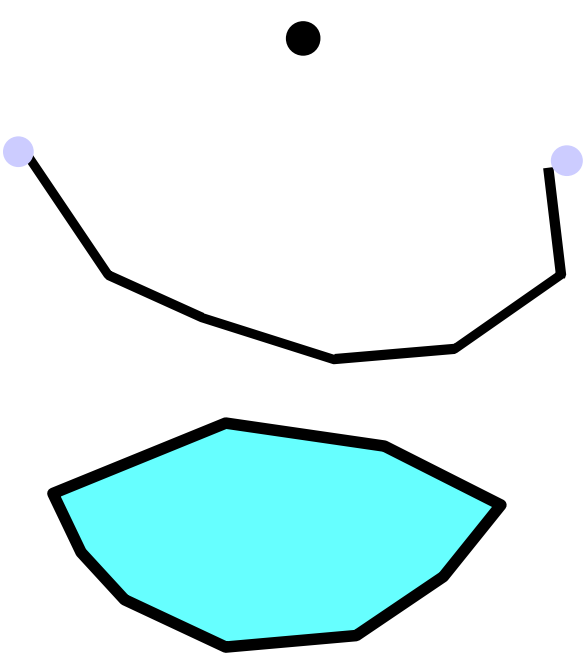
Allows user to specify specific spatial locations and assumes that geographic space is continuous, not broken up into discrete grid squares

We store features as sets of X,Y coordinate pairs.



Entity Representations

We typically represent objects in space as three distinct spatial elements:



Points - simplest element

Lines (arcs) - set of connected points

Polygons - set of connected lines

We use these three spatial elements to represent real world features and attach locational information to them.

Attributes

- In the raster data model, the cell value (Digital Number) is the attribute. Examples: brightness, landcover code, SST, etc.
- For vector data, attribute records are linked to point, line & polygon features. Can store *multiple* attributes per feature. Vector features are linked to attributes by a *unique feature number*.

Raster vs. Vector

Raster Advantages

The most common data format

Easy to perform mathematical and overlay operations

Satellite information is easily incorporated

Better represents “continuous”- type data

Vector Advantages

Accurate positional information that is best for storing discrete thematic features (e.g., roads, shorelines, sea-bed features.

Compact data storage requirements

Can associate unlimited numbers of attributes with specific features

GIS FUNCTIONALITY

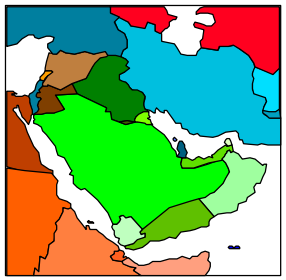
(What do they do?)

GIS Functions

- Data Assembly
- Data Storage
- Spatial Data Analysis and Manipulation
- Spatial Data Output

GIS Functions

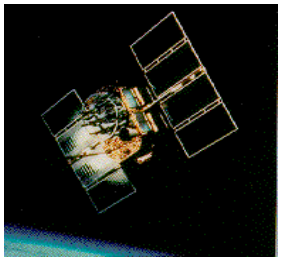
Data Assembly



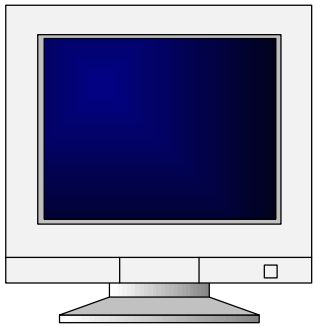
Maps

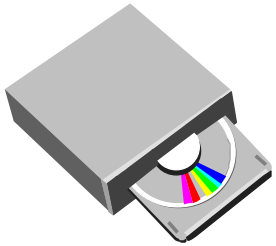
Manual Digitizing
Scanning

Manual Digitizing
Scanning



RSI





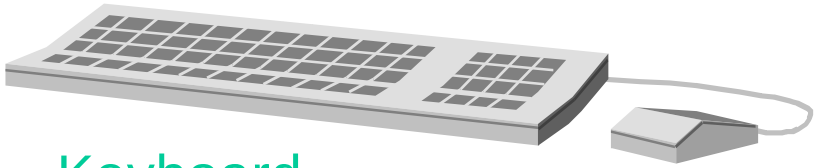
Intel Database

Data Transfer

Data Transfer

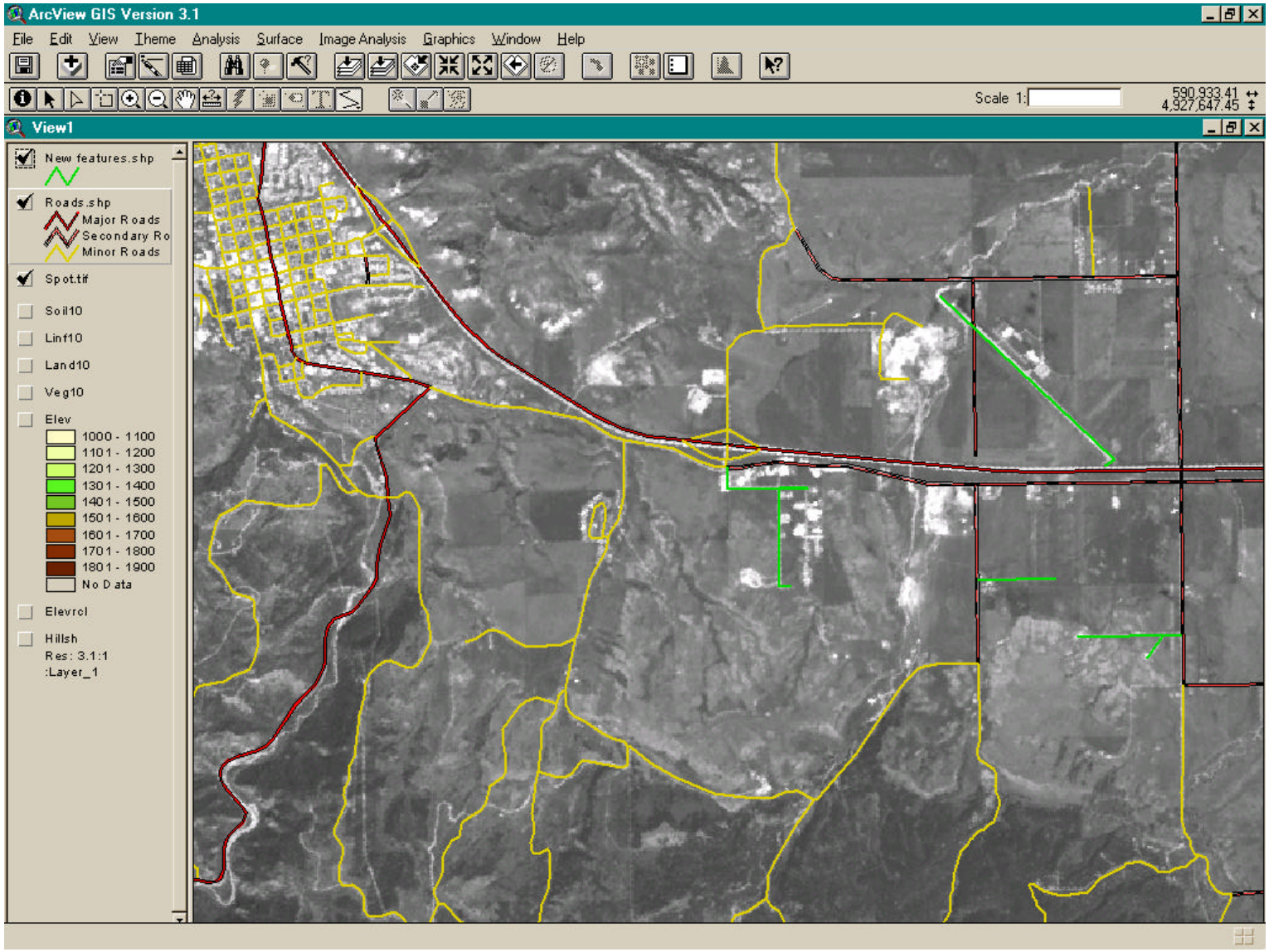
GPS

Direct Entry



Keyboard

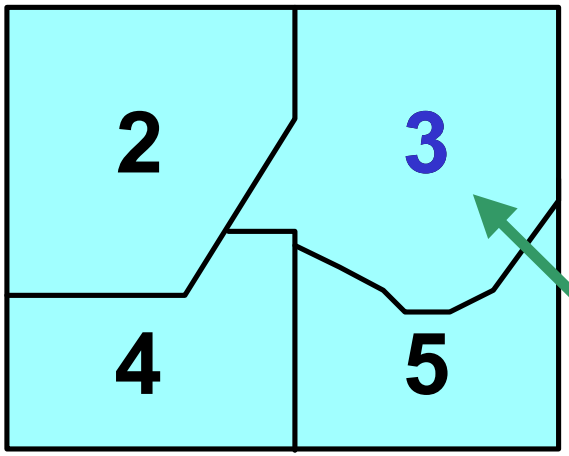
Data Input/Creation



GIS Functions

GIS Storage

1 (Universe polygon)



Spatial data
(ARC functions)

Attribute data
(INFO or TABLES functions)

COV#	ZONE	ZIP
1		0
2	C-19	22060
3	A-4	22061
4	C-22	22060
5	A-5	22057

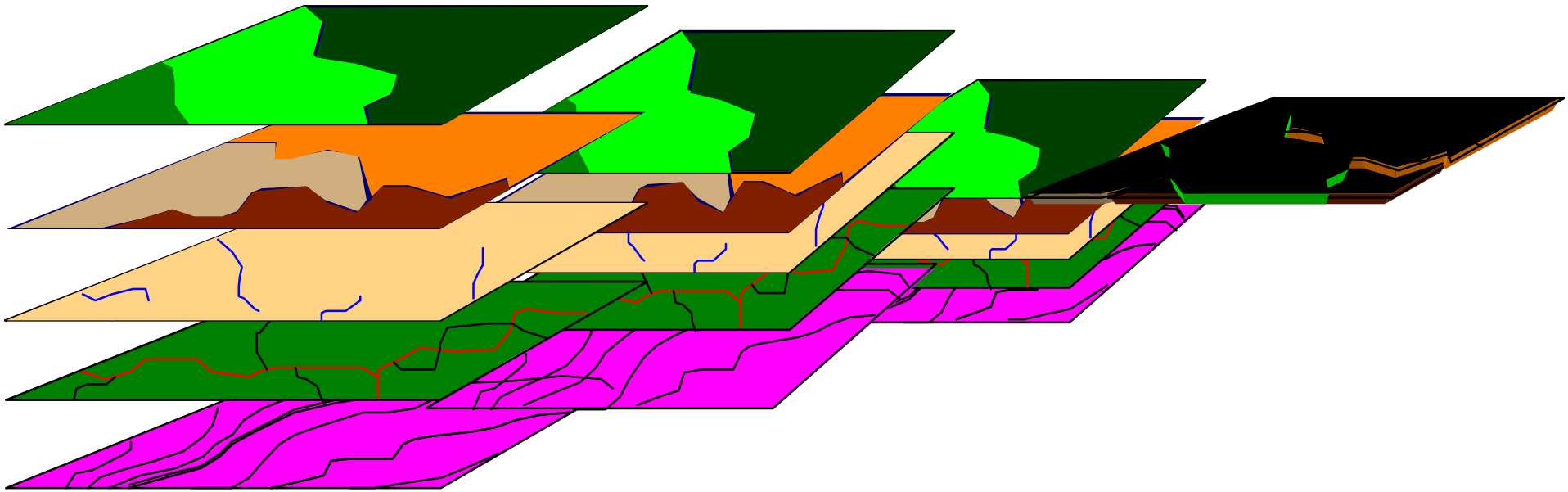
GIS Functions

Spatial Data Manipulation and Analysis

- Common Manipulation
  - Reclassification
  - Map Projection changes
- Common Analysis
  - Buffering
  - Overlay
  - Network

Spatial Analysis

- Overlay function creates new “layers” to solve spatial problems



GIS Functions

Spatial Data Output

- Tables
- Maps
- Interactive Displays
- 3-D Perspective View

Attributes of Pop Built-up Areas(vm1)

Shape	id	l_code	l_code description	exs	exs description	nam
Polygon	1	AL020	Built-Up Area	999	Other	Vinkovci
Polygon	2	AL020	Built-Up Area	999	Other	Nustar
Polygon	3	AL020	Built-Up Area	999	Other	Bobota
Polygon	4	AL020	Built-Up Area	999	Other	Otok
Polygon	5	AL020	Built-Up Area	999	Other	Bijelo Brdo
Polygon	6	AL020	Built-Up Area	999	Other	Trpinja
Polygon	7	AL020	Built-Up Area	999	Other	Komletinci
Polygon	8	AL020	Built-Up Area	999	Other	UNK
Polygon	9	AL020	Built-Up Area	999	Other	Backi Monostor
Polygon	10	AL020	Built-Up Area	999	Other	Hercegszanto