Raster Data Structure

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References:
Introduction to Geographic Information Systems, Chang
http://www.cs.berkeley.edu/~demmel/cs267/lecture26/lecture26.html

Raster Data Model

- Elements - Cell value, cell size, bands, spatial reference
- Types - Satellite Imagery, DEM's, Digital Orthophotos, Bi-Level Scanned Files, DRG's, Graphic Files (.jpeg, .tiff, .geotiff, .gif), and ESRI Grid.
- **Structure**
- Compression – Reduction of data volume
- Conversion and Integration - Rasterization/Vectorization

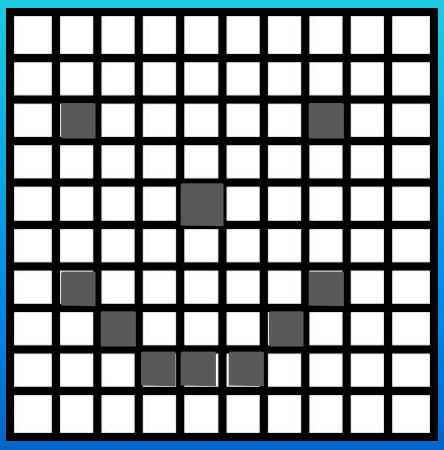
Raster Data Structure

Refers to the *method* or *format* for storing raster data so that it can be used efficiently.

- Cell-by-Cell Encoding
- Run-Length Encoding
- Quad Tree

Cell-by-Cell Encoding

- Used when values change continuously

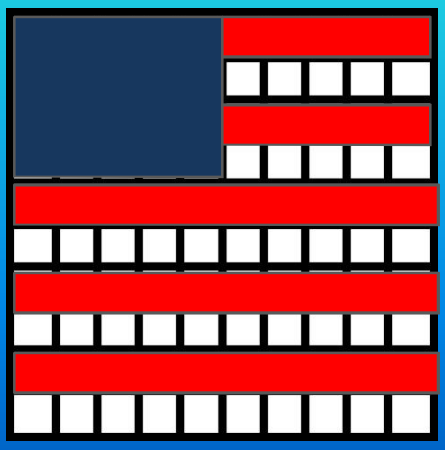


Cell-by-Cell Encoding

- Cell values are written into a file by row and *column*
- Multiband
  - Band sequential (.bsq)
    - Ex: RGB bands R file, G file, B file
    - Multiple files
  - Band interleaved by line (.bil)
    - Ex: Row 1, band 1; Row 2 band 2; …
    - Single file
  - Band interleaved by pixel (.bip)
    - Ex: Pixel (1,1), band 1; Pixel (1,1), band 2; …
    - Single file

Run-Length Encoding

- Used when values are redundant

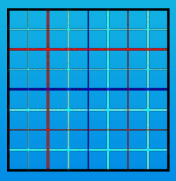


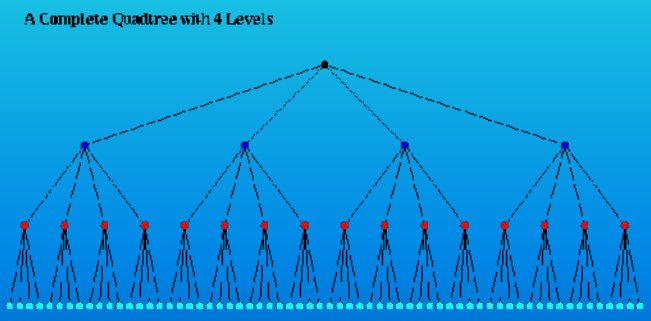
Run-Length Encoding

- Cell values are written into a file by row and *group*
- Starting and ending cells with the same value
- Method for encoding as well as compressing

Quad Tree

- Recursive decomposition

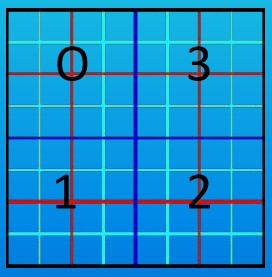




http://www.cs.berkeley.edu/~demmel/cs267/lecture26/lecture26.html

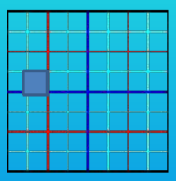
Quad Tree

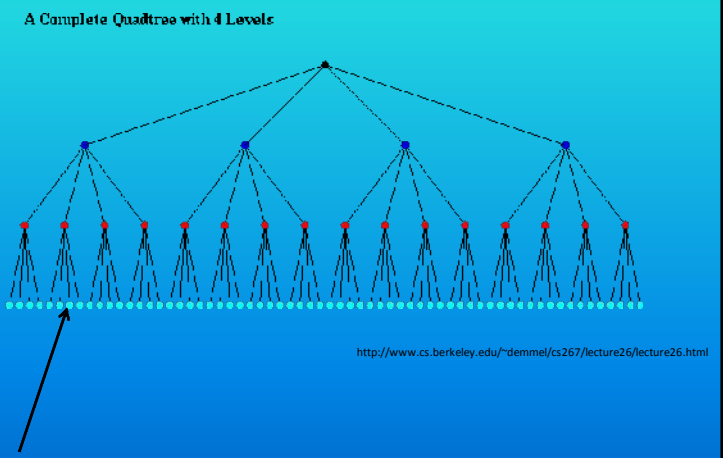
- Division stops when all cells in the quadrant contains a single value.
- Coded using quad tree and spatial indexing method.
  - NW = 0
  - SW = 1
  - SE = 2
  - NE = 3



- Similar to "Township Range" System, but describes the location differently.

Quad Tree





Location = 012

Header File

- Contains information about the raster
  - Data Structure
  - Area Extent
  - Cell Size
  - Number of Bands
  - Value for "No Data"
- Other types
  - Statistics file for each band
  - Color file associates colors with pixel values

Review Questions

What are the 3 methods for storing raster data?

Which method is used for continuously changing cell values?

Name 3 file types (extensions) for multiband imagery?

A _____ file accompanies the raster and gives the GIS information about how to import the raster.

Review Questions

What are the 3 methods for storing raster data?

ANSWER: Cell-by-Cell Encoding, Run Length Encoding and Quad tree

Which method is used for continuously changing cell values?

ANSWER: Cell-by-Cell Encoding

Name 3 file types (extensions) for multiband imagery?

ANSWER: band sequential (.bsq)
band interleaved by line (.bil)
band interlaved by pixel (.bip)

A _____ file accompanies the raster and gives the GIS information about how to import the raster.

ANSWER: Header