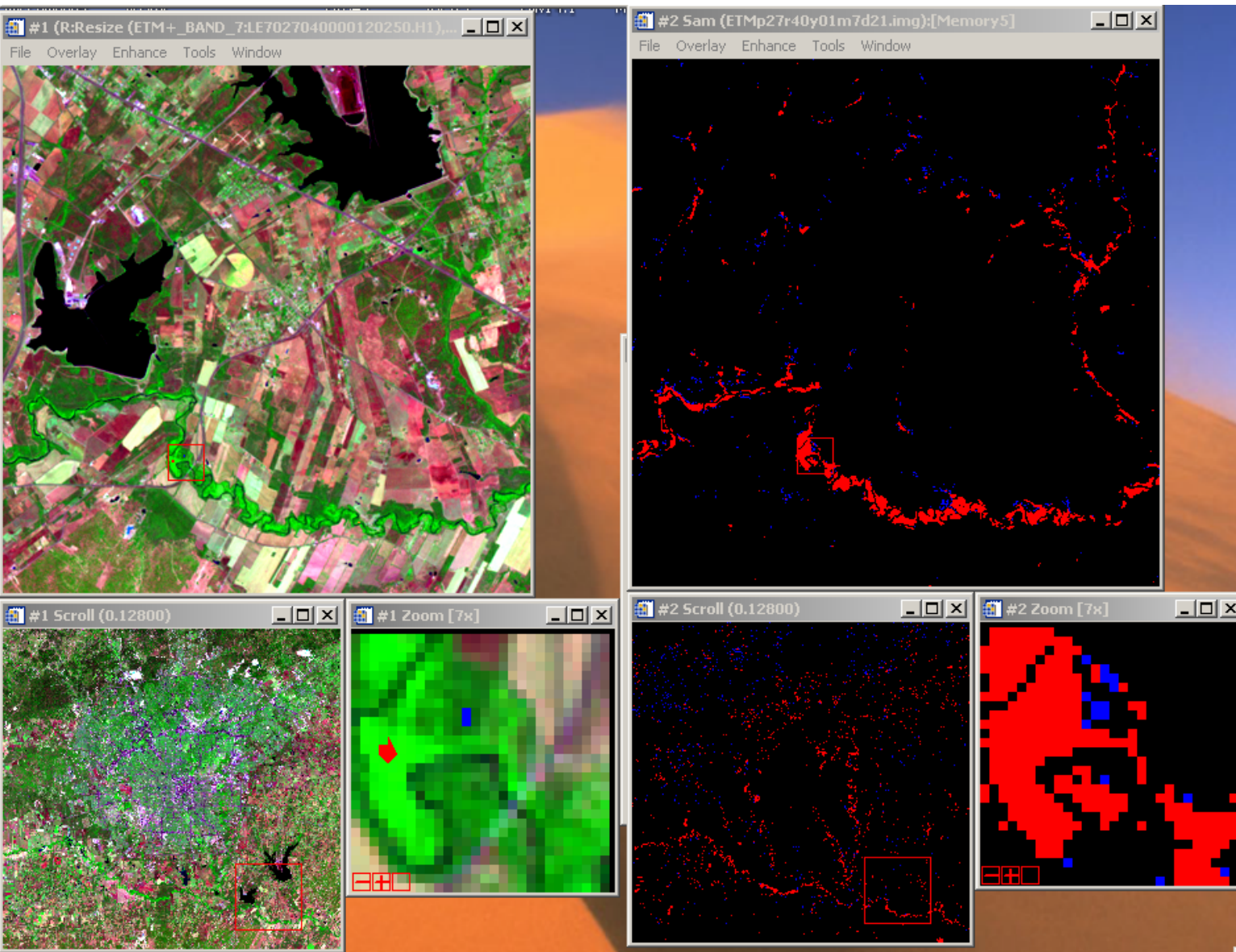


Post-classification and GIS

Lecture 9

March 25, 2005

Why?



**salt-
and-
pepper**

Majority/Minority Analysis

- Apply majority or minority analysis to a classification image.
 - Use majority analysis to change spurious pixels within a large single class to that class. You enter a kernel size and the center pixel in the kernel will be replaced with the class value that the majority of the pixels in the kernel has.
 - If you select Minority analysis, then the center pixel in the kernel will be replaced with the class value that the minority of the pixels in the kernel has

Majority filter: example

Binary image with 5% 'Salt&Pepper' noise



3x3 majority filter



20% 'Salt&Pepper' noise



3x3 majority filter















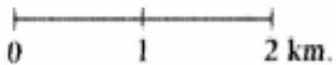
Maximum likelihood result



Majority filter applied

Legend key

-  Grass
-  High density urban
-  Low density urban
-  Row crops
-  Small grain crops
-  Non-row crops
-  Bare soil
-  Forest
-  Wetland
-  Water



Stuckens et al., 2000

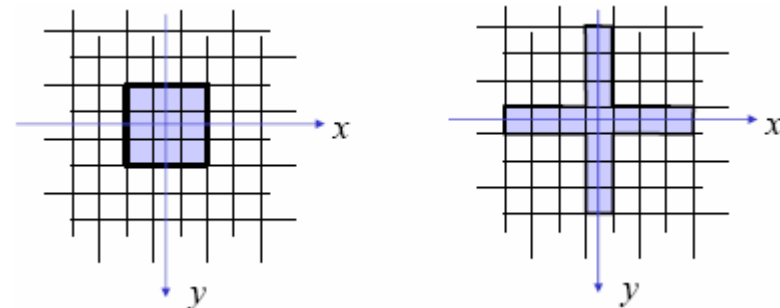
Remote Sensing of Env.

Clump Classes

- Clump adjacent similar classified areas together using morphological operators. Classified images often suffer from a lack of spatial coherency (speckle or holes in classified areas). The selected classes are clumped together by first performing a **dilate** operation and then an **erode** operation on the classified image using a kernel of the size specified in the parameters dialog.

Morphology Filters

- **Dilate Filter** commonly known as fill, expand, or grow. It **fill holes** smaller than the structural element (kernel) in a binary or grayscale image.
- **Erode Filter** commonly known as shrink or reduce. It **removes islands** of pixels smaller than the structural element (kernel) in a binary or grayscale image.
- **Open Filter**: erosion + dilation
- **Close Filter**: dilation + erosion
- Clump is a close filter.
- Morphology kernels are just a structuring element and should not to be confused with convolution kernels.



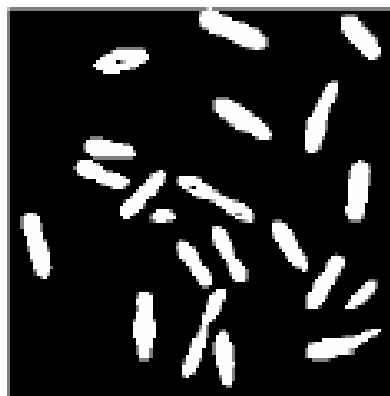
Dilation

- Binary dilation operator

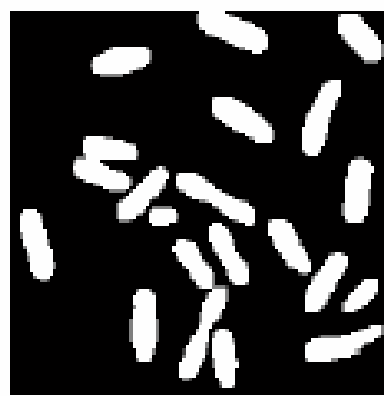
$$g(x, y) = OR \left[W \{ f(x, y) \} \right] := dilate(f, W)$$

- Effects

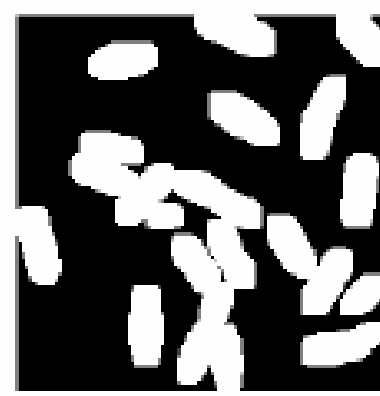
- Expands the size of 1-valued objects
- Smooths object boundaries
- Closes holes and gaps



Original (178x178)



dilation with
3x3 structuring element

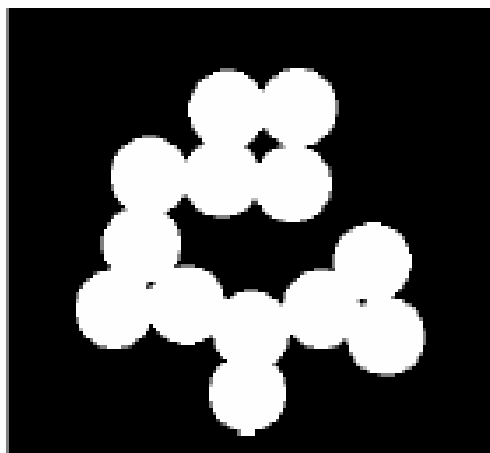


dilation with
7x7 structuring element

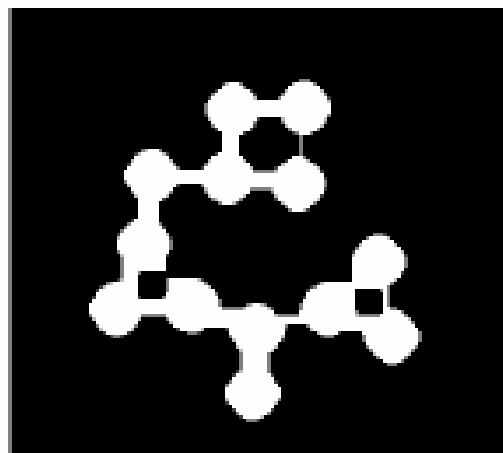


Example: blob separation/detection by erosion

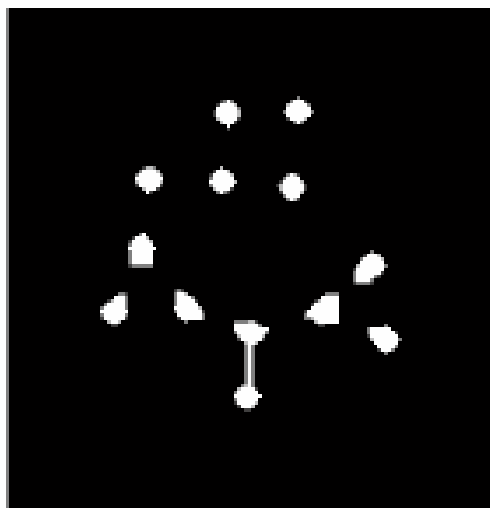
Original
binary
image
circles



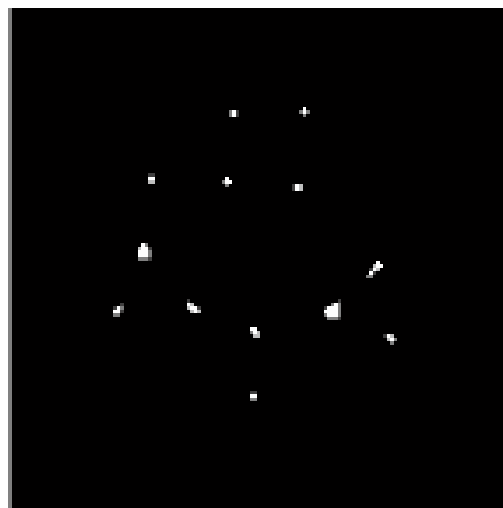
Erosion
by 11x11
structuring
element



Erosion
by 21x21
structuring
element



Erosion
by 27x27
structuring
element

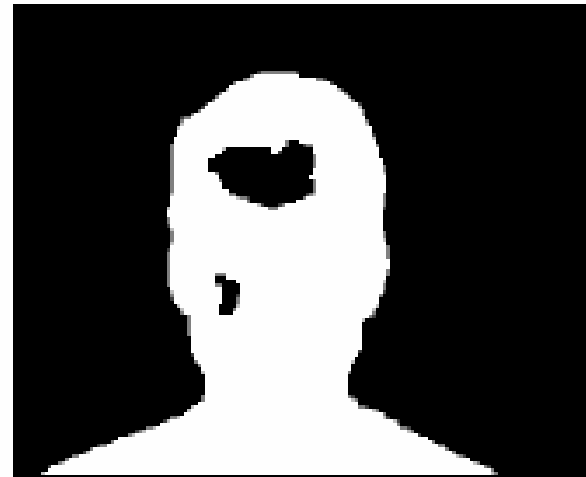


Small hole removal by closing

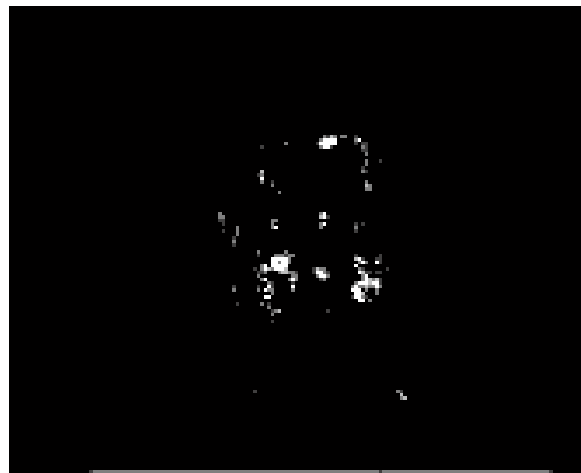
Original
binary
mask



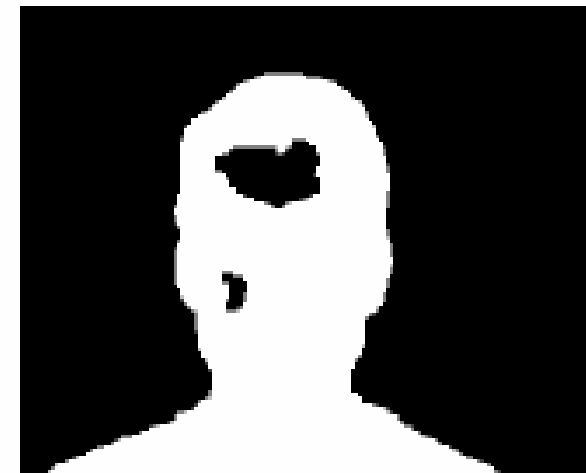
Dilation
5x5



Difference
to original
mask



Closing
5x5



Sieve Classes

- Sieve Classes to solve the problem of isolated pixels occurring in classification images. Sieving classes removes isolated classified pixels using blob grouping. The sieve classes method looks at the neighboring 4 or 8 pixels to determine if a pixel is grouped with pixels of the same class. If the number of pixels in a class that are grouped is less than the value that you enter, those pixels will be removed from the class. When pixels are removed from a class using sieving, black pixels (unclassified) will be left.

Combine Classes

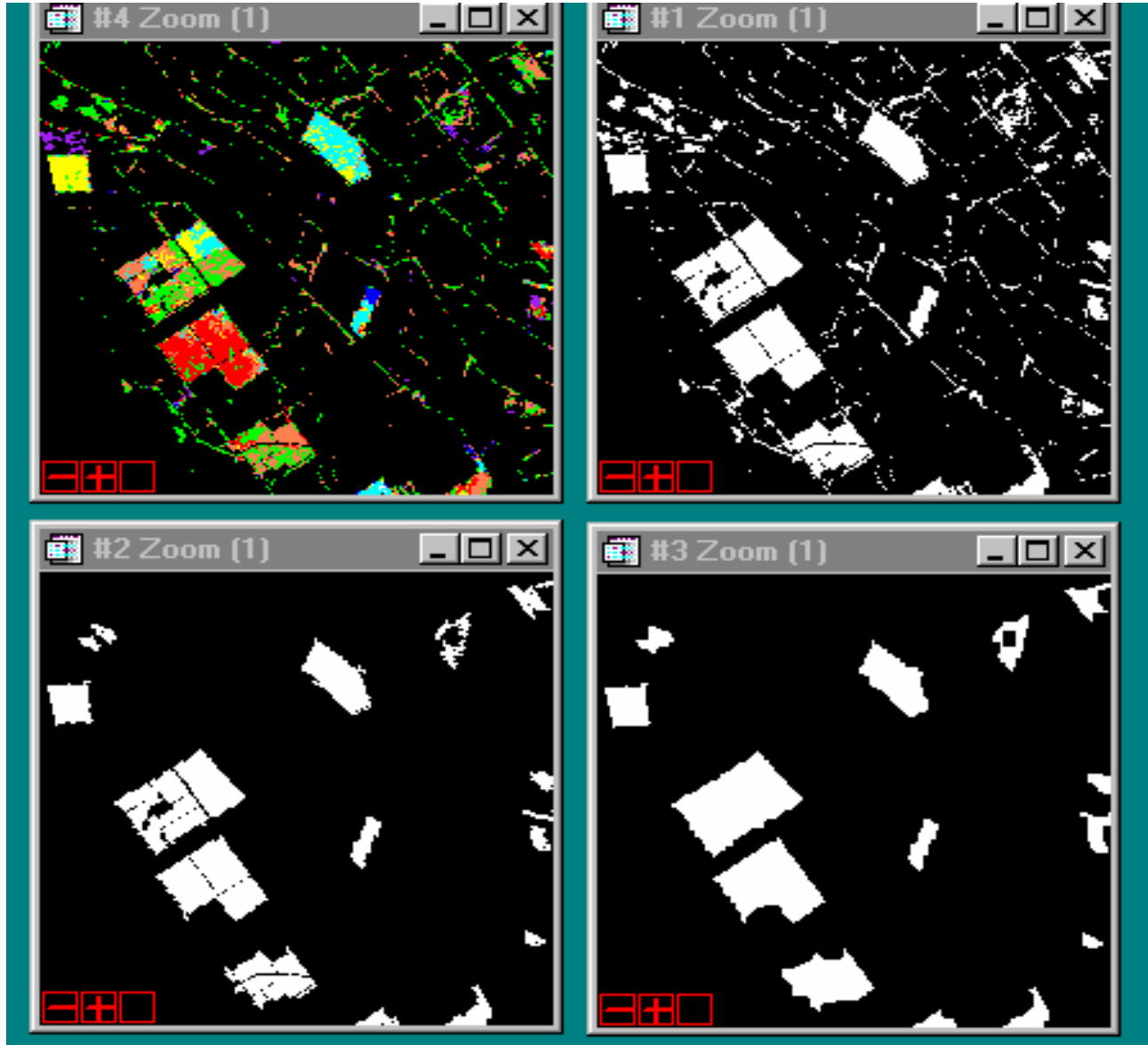
- Use Combine Classes to selectively combine classes in classified images

Classification to vector

- Convert your classified classes into vector .evf
- Convert the .evf to .shp then ArcGIS can open it.
- ArcGIS can open ENVI's .img file

An example

SAM



Combine

Sieve

Clump

Images	Time	Active crops	Fallow land
IKONOS	2000, Aug.- 2001, Feb.	SAM threshold: 0.03 Combine Sieve threshold: 4 Clump operator: 6×6 Sieve threshold: 400 Clump operator: 9×9 Class to vector	SAM threshold: 0.03 Combine Sieve threshold: 2 Clump operator: 10×10 Sieve threshold: 200 Class to vector
ETM+	2001, Jul. 15	SAM threshold: 0.10 Combine Sieve threshold: 3 Class to vector	SAM threshold: 0.05 Combine Sieve threshold: 3 Class to vector
	2001, Apr. 26	SAM threshold: 0.08 Combine Sieve threshold: 6 Clump operator: 2×2 Sieve threshold: 10 Class to vector	SAM threshold: 0.06 Combine Sieve threshold: 10 Class to vector
	2000, Sept. 07	SAM threshold: 0.13 Combine Sieve threshold: 50 Class to vector	SAM threshold: 0.05 Combine Sieve threshold: 50 Class to vector
	2000, June 10	SAM threshold: 0.13 Combine Sieve threshold: 10 Class to vector	SAM threshold: 0.05 Combine Sieve threshold: 10 Class to vector
	1999*, Sept. 12	SAM threshold: 0.35 Combine Sieve threshold: 10 Class to vector	SAM threshold: 0.20 Combine Sieve threshold: 25 Class to vector