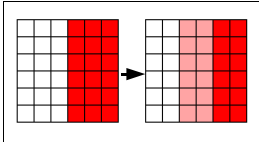


Image Manipulation

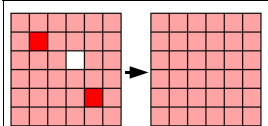
Smoothing Sharp edges

Rule: Replace each value by the mean of its value and those of surrounding pixels.

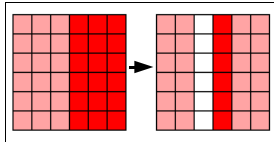
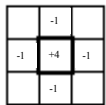


Removing noise

Replace each pixel by the median of its value and the surrounding pixel values.



Finding Edges



Subtract the N, S, E and W pixel values from 4 times the value of each pixel.

Lenses

Curvature added = $1/f$
Dioptres (D)

Lens Formula:

$$\frac{1}{v} = \frac{1}{u} + \frac{1}{f}$$

$m = v/u$ (magnification)
 $u = -$ number

Curvature of light after lens = Curvature before the lens + Curvature added by lens

Chapter 1 Imaging

Information storage

In computers voltages are stored:
Voltage either ON or OFF



Greyscale Image 256 shades of grey
 10^6 pixels per image

1 pixel needs 1 byte

Memory needed = 1 million bytes (1MB)

Colour needs 3 bytes per pixel

I = amount of information (No. of BITS)
Number of alternatives = 2^I eg $I = 8 = (1 \text{ byte})$ No. of alternatives = $2^8 = 256$

1 extra bit doubles the no. of alternatives.

Binary Numbers:

	1	0					
	2^4	2^3	2^2	2^1	2^0		
Total = 27	1	1	0	1	1		
No. of alternatives	16	8	0	2	1		

256 = all letters = capitals + symbols, no. 1-9

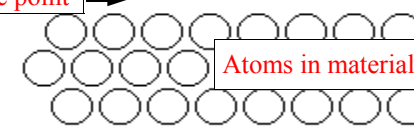
0-255

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	1	1	1	1	1	1	1

Scanning Tunnelling Microscope

Support and control and control arm scans in zig-zags across surface

Ultra sharp needle point



Atoms in material

- Tip is close to atoms → electrons tunnel across gap → electric current between surface and tip
- Tip moved up and down keeping tunnelling current constant.
- The movements of tip are recorded

Speed (m/s)

Wavelength (m)

$$v = f\lambda$$

Time period of a wave (sec)

Frequency (Hz)

$$T = 1/f$$

Resolution: smallest detail distinguishable, size of one



Numbers can be manipulated

Darker Region - larger number

Set of numbers

1 number = Picture element (Pixel)