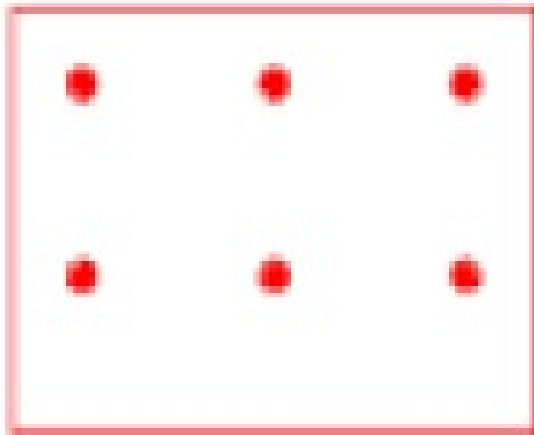


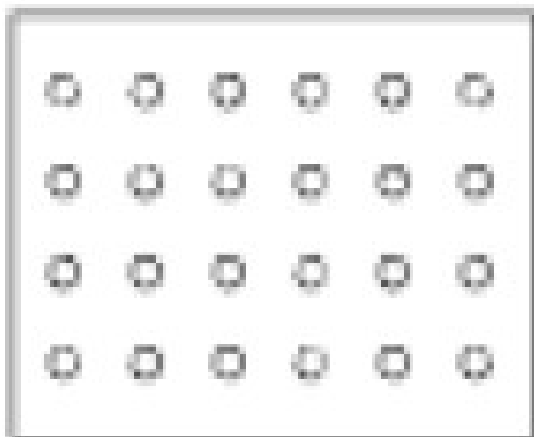
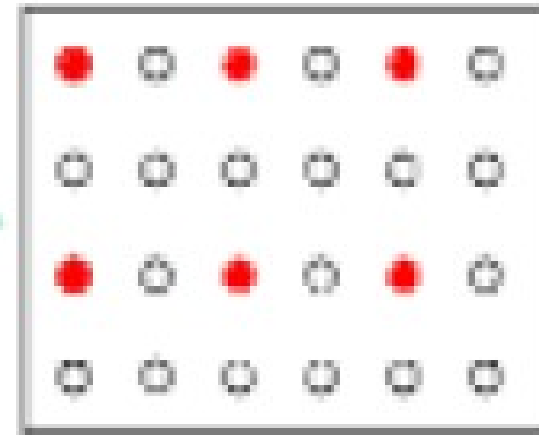
# Image Interpolation

( 14 December )

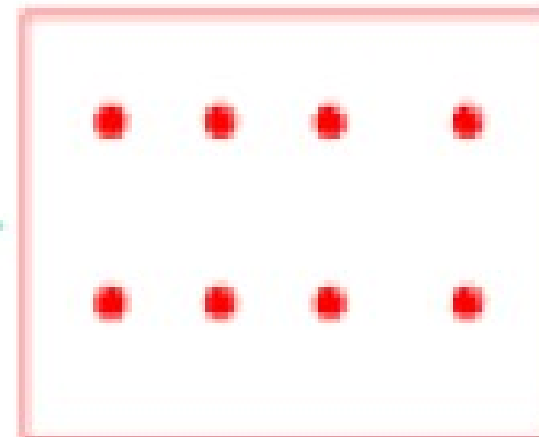
# Zooming And Shrinking



zooming



shrinkage



# Upsampling



(a)



(b)

# Downsampling



**(a)**

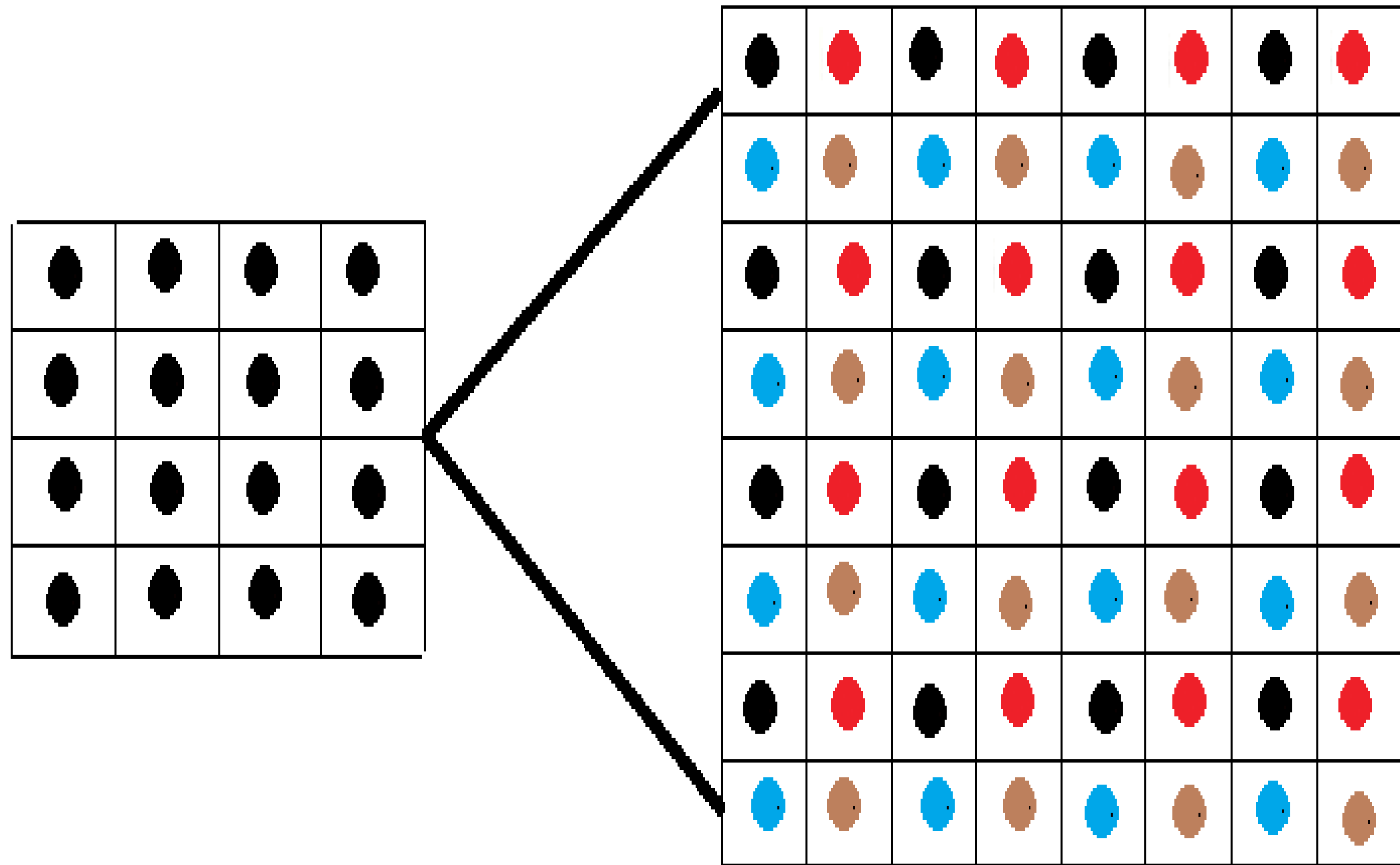


**(b)**

# Interpolation

- To predict the unknown pixel with the help of known ones
- From higher resolution to a lower resolution, is down -sampling
- From lower resolution to a higher resolution, is up-sampling

# UpSampling (M X N to 2M X 2N)



# Pixel Position



Odd-Odd Position



Odd-Even Position



Even-Odd Position



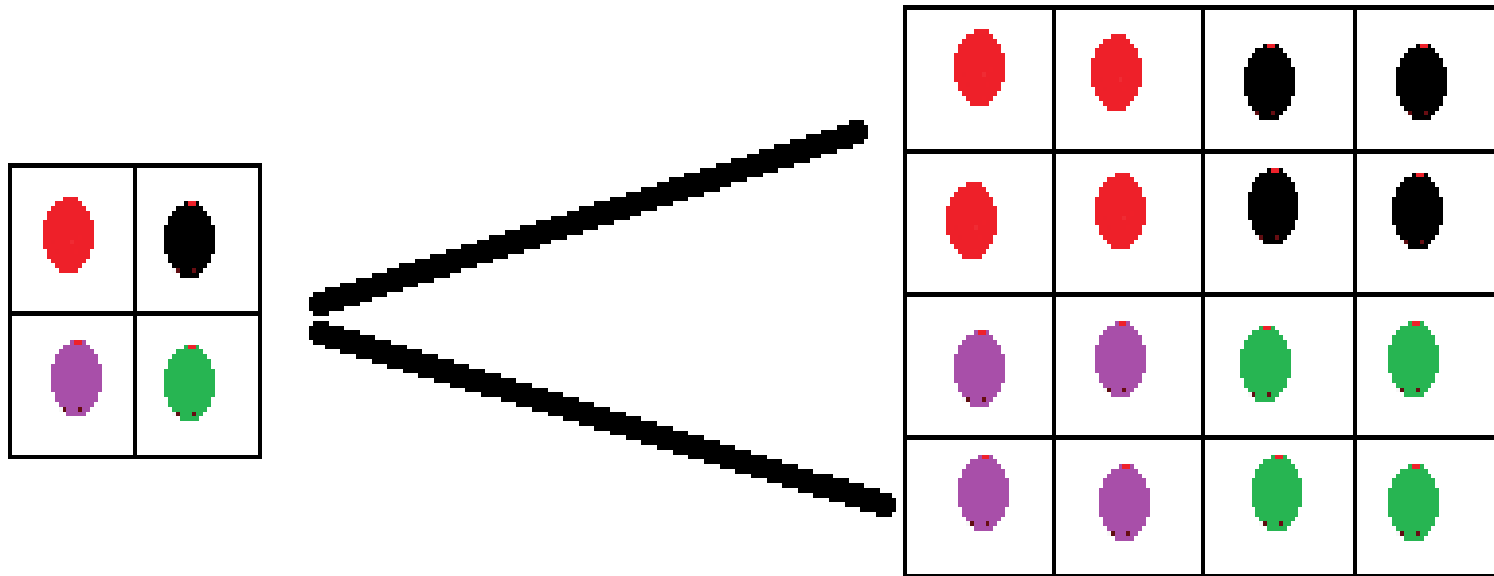
Even-Even Position

# Some Interpolation Technique

- Nearest Neighbour Interpolation
- Bilinear Interpolation
- Bicubic Interpolation



# Nearest Neighbour Interpolation

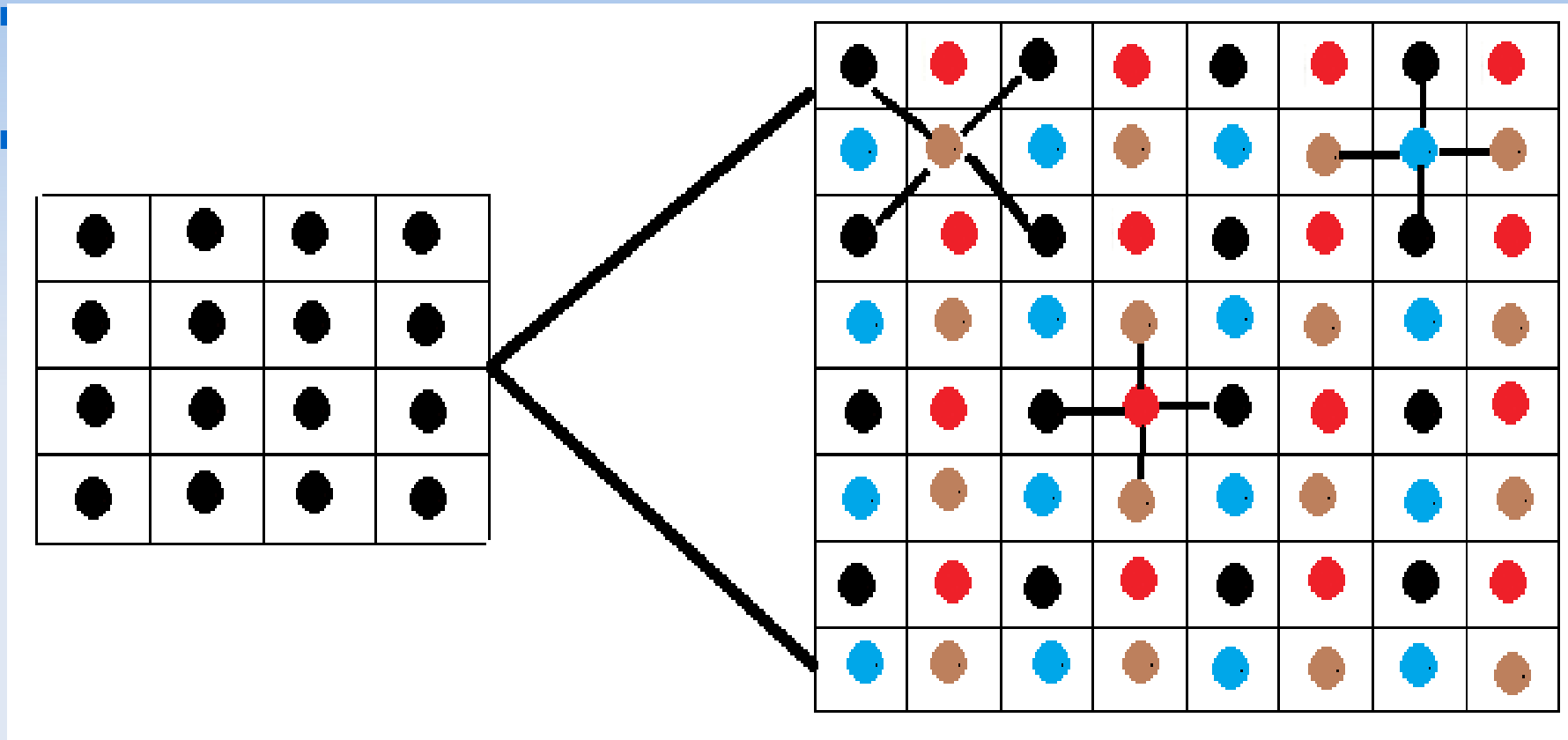


In this (a) is the LR (Low Resolution) and (b) is the HR (High Resolution)

# Nearest Neighbour Interpolation

- **i) How to interpolate an image of size**
  - **2X2 to 7X7 ??**
- li) How to interpolate if scaling factor is less than 1 ??**

# Bilinear Interpolation



Here Missing pixels are predicted with the weighted sum of four of the nearest available pixels.

# Bilinear Interpolation

- i) How to interpolate an image of size 2X2 to 7X7 ??**
- ii) How to interpolate if scaling factor is less than 1 ??**
- iii) Error propagation occurs in Bilinear interpolation from first pass to second pass.**
- iv) How can we decrease Error propagation**

# Bicubic Interpolation

- It uses 16 neighbouring pixels for prediction of unknown pixel.
- It is computationally expensive than bilinear and Nearest neighbour interpolation.

# Peak Signal To Noise Ratio

- Let  $I$  is input original image (Without any distortion)
- Let  $I'$  be downsampled image
- Let  $O$  be final interpolated output image
- Then Error image ( $E$ ) =  $I - O$

# Peak Signal To Noise Ratio

- Then E is our noisy image
- Mean\_Square\_Error (MSE) =  $SE / (a*b)$ ;

Where SE is square Error of Error image

- $PSNR = \{(255)^2\} / (MSE)$

- PSNR in dB =  $10 * \log_{10}(PSNR)$

# Thanks...!

