AN ADAPTIVE DECISION BASED KRIGING INTERPOLATION ALGORITHM FOR THE REMOVAL OF HIGH DENSITY SALT AND PEPPER NOISE IN IMAGES

Kriging

- Kriging is the most powerful statistical interpolation method. This interpolation is linear, since the interpolated values are weighted linear combinations of available uncorrupted pixels in a closed neighborhood

$$v(\mathrm{h}) = v(\mathrm{K}(\mathrm{i1}), \mathrm{K}(\mathrm{i2})) = v(\mathrm{K}(\mathrm{ix}), \mathrm{K}(\mathrm{ix}+\mathrm{h}))$$

$$\mathrm{h}(\mathrm{i1}, \mathrm{i2}) = (\mathrm{ix}, \mathrm{ix}+\mathrm{h})$$

$$v(\mathrm{h}) = \frac{1}{2*\mathrm{L}} \sum_{x=1}^{\mathrm{L}} (\mathrm{K}(\mathrm{ix}) - \mathrm{K}(\mathrm{ix}+\mathrm{h}))^2$$

Interpolation

$$\check{D} = \sum_{j=1}^{L} Wj * D$$

- Ď is the interpolated value
- D is the set of original samples observed
- W is the weights obtained using Semi variance
- "L" refers to total number of samples observed.

Semivariogram

Y/X	-1	0	1
-1	0	255	255
0	0	0	40
1	39	255	51

Non Noisy Pixel	Z	40	39	51
Y coordinate	m	0	1	1
X Coordinate	n	1	−1	1

H-matrix

$$h\,(u,v) = (m(u) - m(v))\text{^}2 + (n(u) + n(v))\text{^}2$$

$$\mathrm{h}\,(1,2) \ \text{ or } \mathrm{h}\,(2,1) = (\mathrm{m}\,(2) - \mathrm{m}\,(1))^2 + (\mathrm{n}\,(2) - -\mathrm{n}\,(1))^2$$

$$\mathrm{h}\,(1,2) \ \text{ or } \mathrm{h}\,(2,1) = (1 - (0))^2 + ((-1) - 1)^2$$

$$\mathrm{h}\,(1,2) \ \text{ or } \mathrm{h}\,(2,1) = 5$$

h - Matrix	Non Noisy Pixel	**40**	**39**	**51**
	40	0	5	1
	39	5	0	4
	51	1	4	0
Sum (S)		**6**	**9**	**5**
Divide by 2*I (wts)		**1**	**1.5**	**0.833**
Sum:				**3.33**

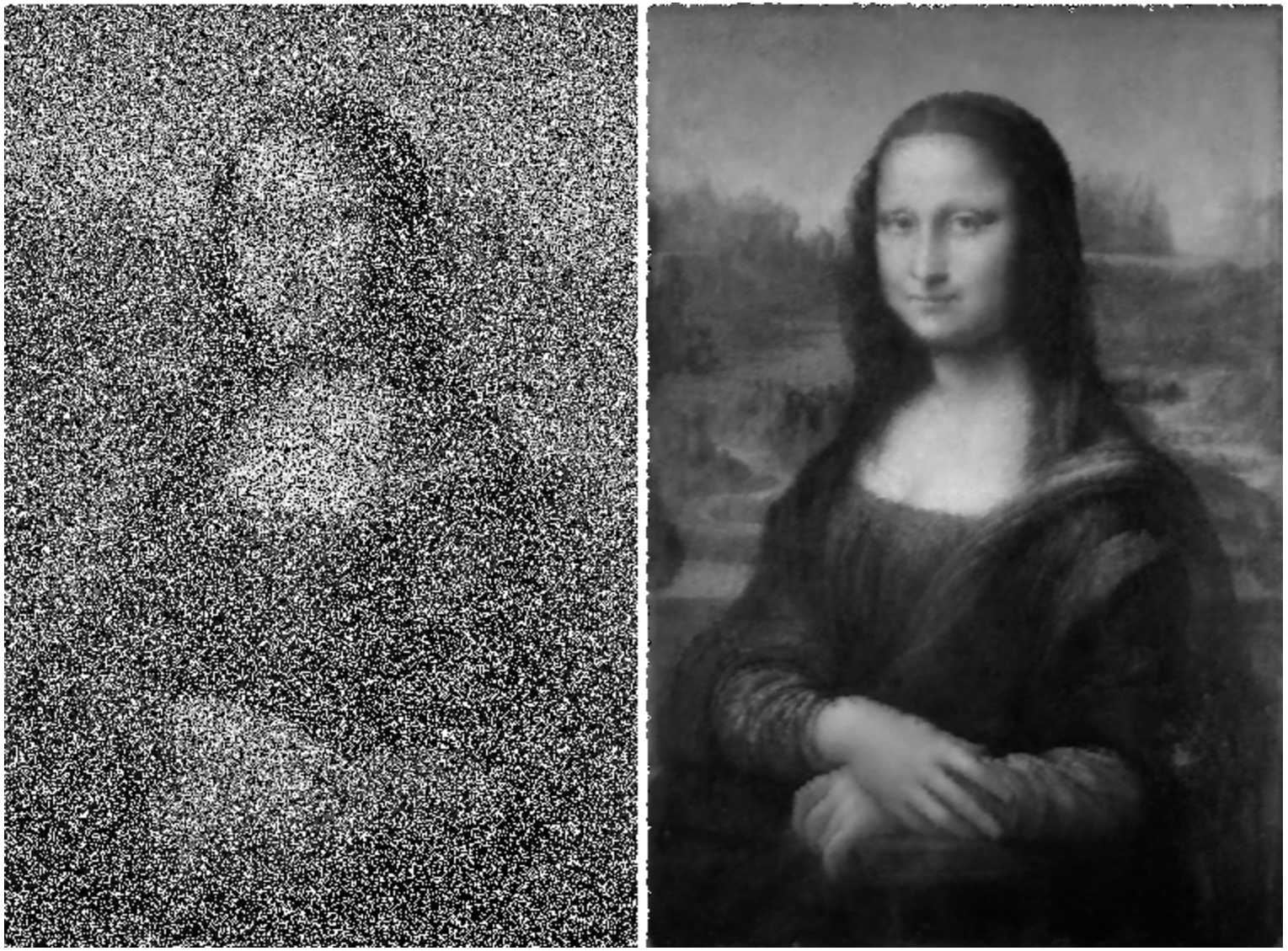
Calculation of interpolation

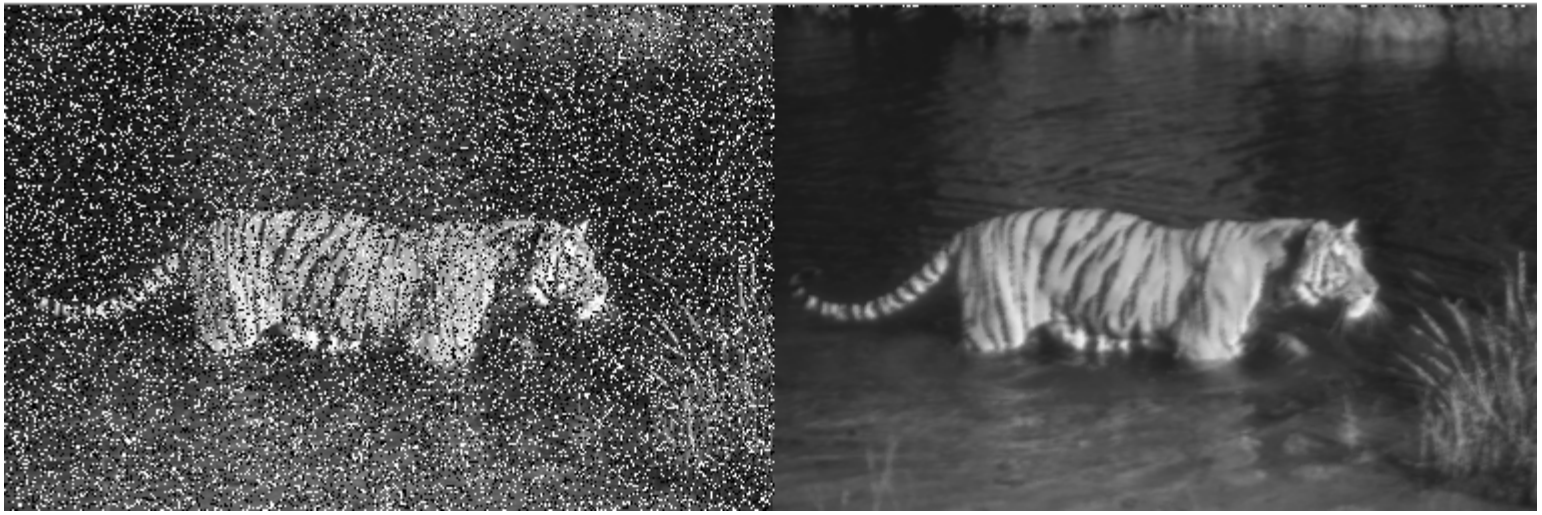
- The formulae used for estimating the pixel at (0,0) using Kriging interpolation is given by the equation

$$O(x,y) = \frac{\sum_{u=1}^{L}(W_u * z_u)}{\sum_{u=1}^{L} \text{sum}}$$

O(x,y) = (40x1+1.5x39+0.833x51)/(3.33)

= 42





References

- https://www.sciencedirect.com/science/article/pii/S0045790617315409#bib0003