Types of smoothing

1) Adaptive Smoothing

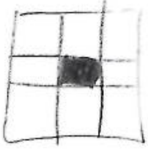
- compute smoothed value s ; we need to specify the threshold, T
- Output = • computed pixel (same as before)   if |computed pixel − (middle original pixel from image)| < threshold

  • middle original pixel from image   otherwise

2) Median Smoothing

- take all n nodes from the n x n matrix (e.g. $\begin{array}{|c|c|c|}\hline n_1 & n_2 & n_3 \\ \hline n_4 & n_5 & n_6 \\ \hline n_7 & n_8 & n_9 \\ \hline \end{array}$ — $n_1, n_2, n_3, n_4, n_5, n_6, n_7, n_8, n_9$) put them in an array, sort, and take the median
- how to take the median? if (odd) $array(\frac{n}{2})$

  else if (even) average $[array(\frac{n}{2}) + array(\frac{n+1}{2})]$

- replace the  with the median

3) Gaussian Smoothing

$T(r) = k \exp - \left(\frac{r^2}{2\sigma^2}\right)$ where k - normalising constant
r^2 - distance of the elem. from the centre
σ - width and size of the template

- used to reduce ringing

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A rank filter will select one value as the smoothed value from the set of pixels in a neighbourhood that have been ranked according to their magnitudes. They are computationally expensive, however, a rank filter using a square neighbourhood may be approximated by two applications of one dimensional rank filters