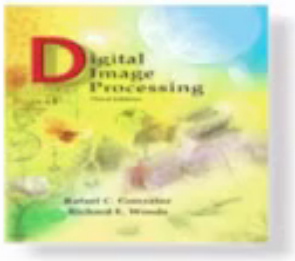

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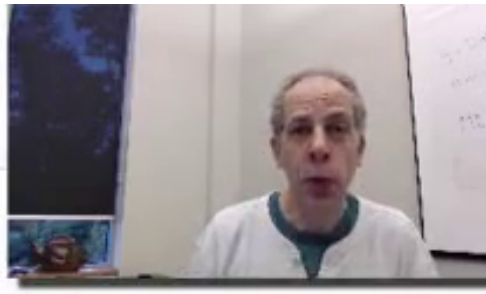

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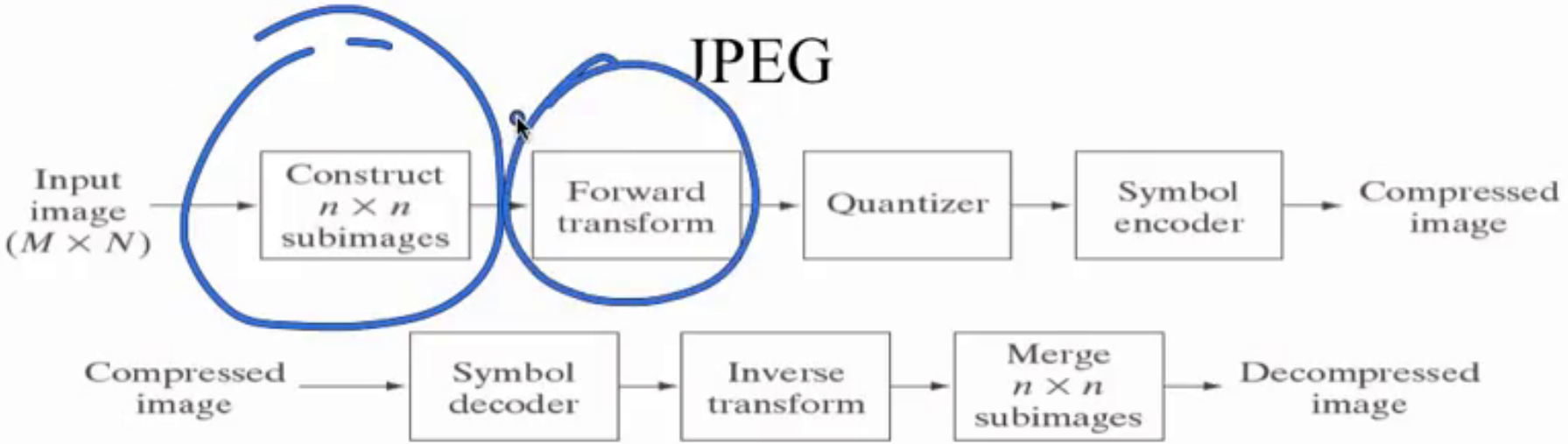

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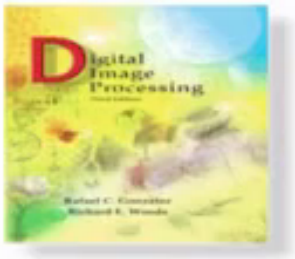

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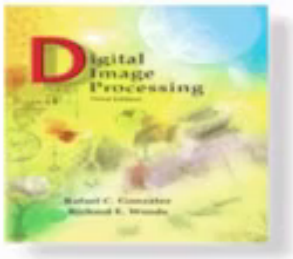
MSE = Mean Square Error

$$MSE = \left[\frac{1}{\text{\# of pixels}} \sum_{\text{pixels}} (\hat{f} - f)^2 \right]^{1/2}$$

n x n Kahunen-Loève

KLT



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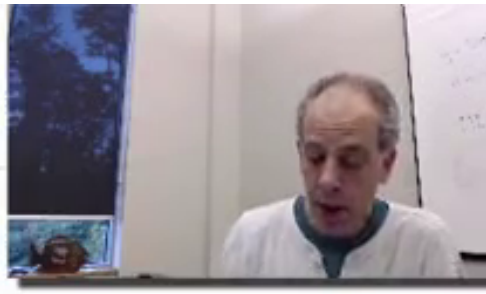

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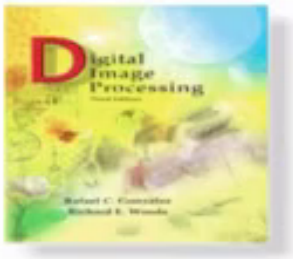
$$T(u,v) = \sum_{x=0}^{n-1} \sum_{y=0}^{n-1} f(x,y)\, r(x,y,u,v)$$

$n \times n$

$$f(x,y) = \sum_{u=0}^{n-1} \sum_{v=0}^{n-1} T(u,v)\, s(x,y,u,v)$$



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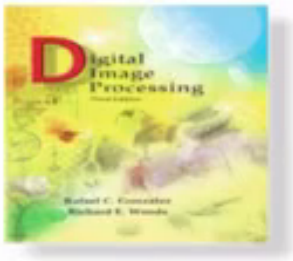
$$r(x,y,u,v) = s(x,y,u,v)$$

$$= \alpha(u)\alpha(v)\cos\left[\frac{(2x+1)u\pi}{2n}\right] \cdot$$

$$\alpha(u) = \begin{cases} \sqrt{\frac{1}{n}} & u = 0 \\ \sqrt{\frac{2}{n}} & u \neq 0 \end{cases} \qquad \cos\left[\frac{(2y+1)v\pi}{2n}\right]$$

DCT



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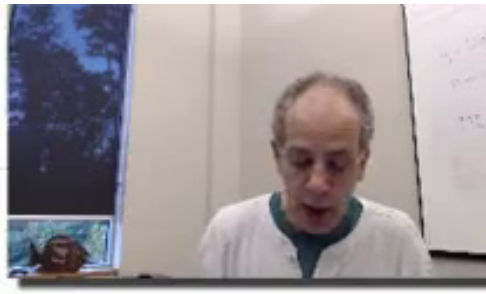

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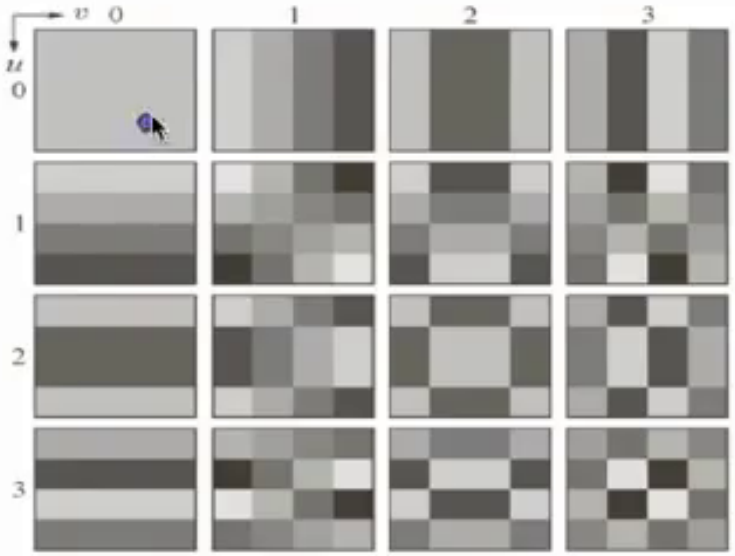
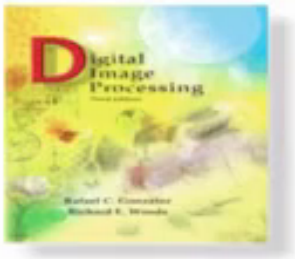
Discrete Cosine Transform



n=4



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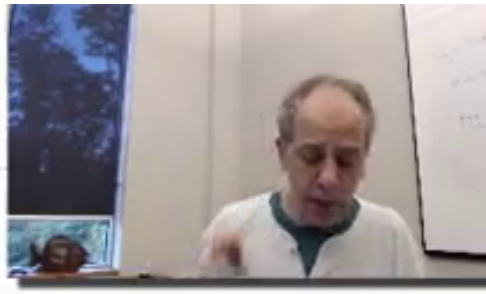
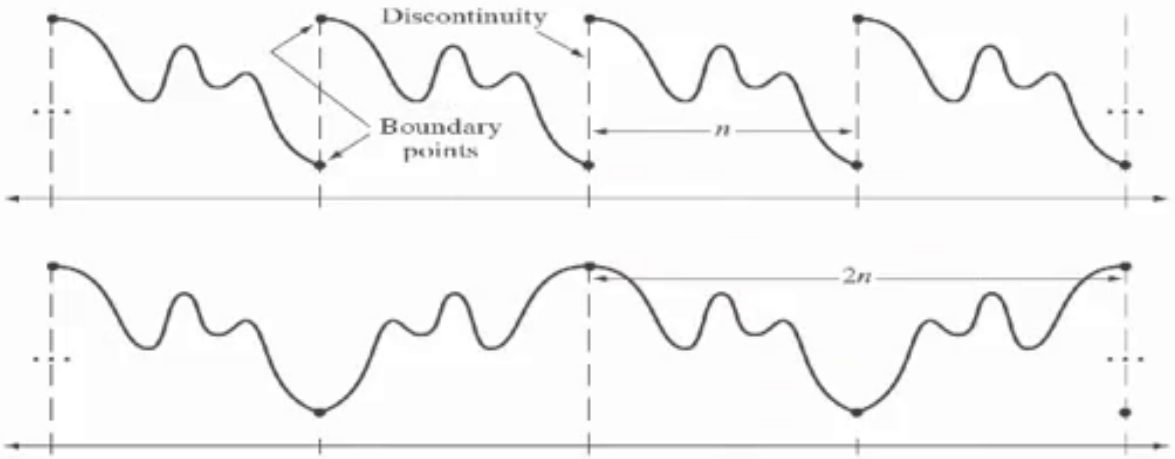
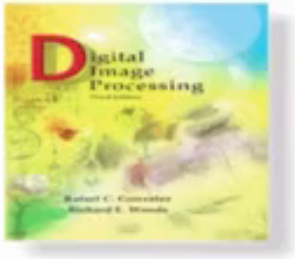


Why DCT?





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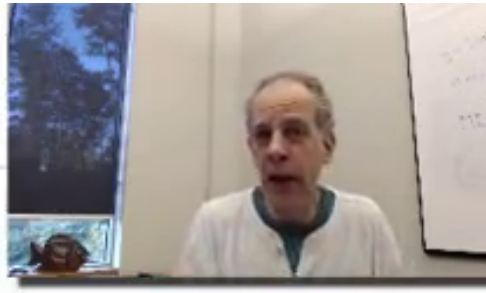

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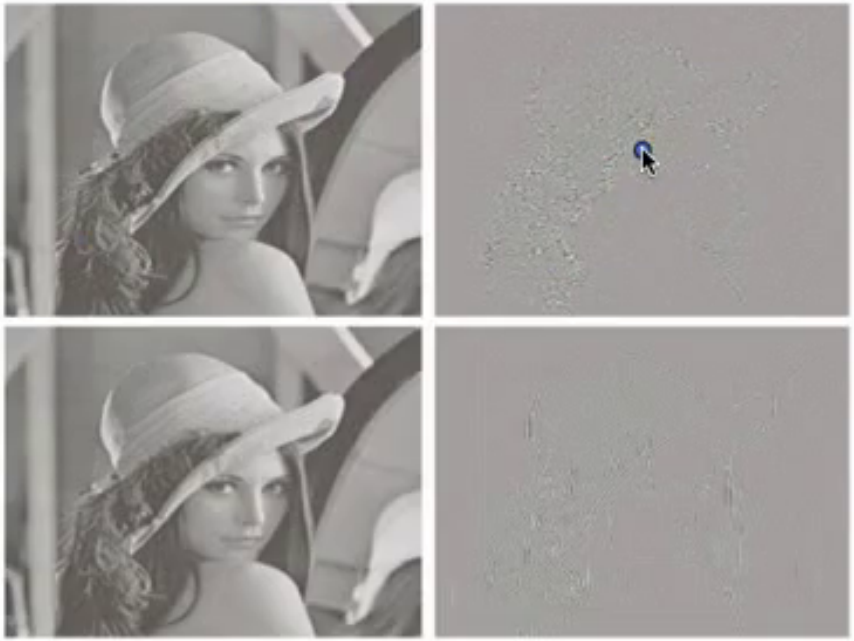
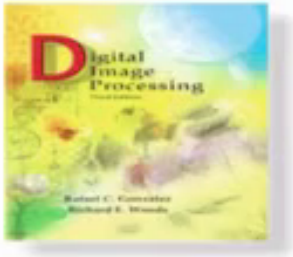


a b
c d

FIGURE 8.28 Approximations of Fig. 8.9(a) using 12.5% of the 8×8 DCT coefficients: (a)—(b) threshold coding results; (c)—(d) zonal coding results. The difference images are scaled by 4.



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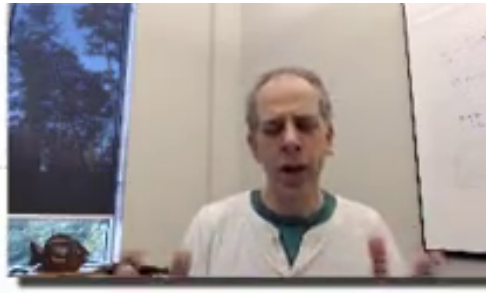

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a b c d

FIGURE 8.27 Approximations of Fig. 8.27(a) using 25% of the DCT coefficients and (b) 2×2 subimages, (c) 4×4 subimages, and (d) 8×8 subimages. The original image in (a) is a zoomed section of Fig. 8.9(a).