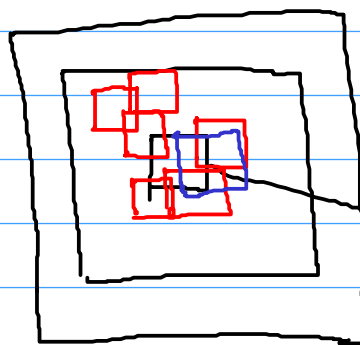


denoising HWS

L patches most similar to q_{ref} .



$$\hat{I} = \hat{j} + \text{noise}$$

$$q_{ref} \quad p \times p$$

$$p = 7$$

$X \rightarrow p^2 \times L$ vectorise each patch

$$[V, D] = \text{eig}(X X^T) \rightarrow \text{correlation matrix}$$

find eigen coefficients of each patch in X

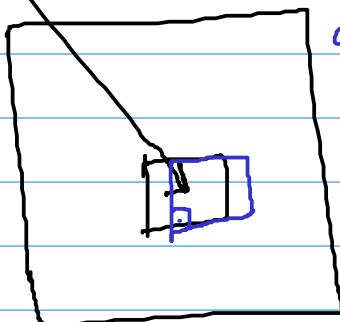
$\alpha_i =$ eigcoeffs of i^{th} patch q_i

$$\beta_{ref}(l) = \text{denoised } l^{th} \text{ eigcoeff of } q_{ref}$$

$$l = 1 \text{ to } p^2 = \alpha_{ref}(l) \frac{\beta^2(l)}{\beta^2(l) + \sigma^2} \rightarrow \text{noise variance (known)}$$

denoised patch = $V^T \beta_{ref}$

$$\beta^2(l) = \max \left[0, \frac{1}{L} \sum_{i=1}^L \alpha_i^2(l) - \sigma^2 \right]$$



array of zeros \rightarrow DN

$$DN(i:i+p-1, j:j+p-1)$$

$$= DN(i:i+p-1, j:j+p-1) + \underbrace{V^T * \beta_{ref}}_{\text{reshaped}}$$

$$\text{count}(i:i+p-1, j:j+p-1) + 1;$$

$$DN = DN ./ \text{count}$$

display DN.