

We can measure the image distortion of the reconstructed image  $I'(x, y)$  from the original image  $I(x, y)$  in Peak Signal to Noise Ratio (PSNR). PSNR is parameterized with Mean Square Error (MSE) which is the cumulative squared error between these two images. Here,  $M, N$  are the dimensions of the image.

$$MSE = \frac{1}{MN} \sum_{y=1}^M \sum_{x=1}^N [I(x, y) - I'(x, y)]^2$$

$$PSNR = 20 \cdot \log_{10} \frac{255}{MSE^{\frac{1}{2}}}$$

The sample code can be:

```
function psnr = img_psnr(src, dst)
%
% mse = \frac{1}{MN} \sum_y \sum_x [I(x,y)-I'(x,y)]
%
% PSNR = 20 * log10 (255 / sqrt(mse))
%
% Winston Hsu, 03/04/2005
%

[s_h, s_w] = size(src);
[d_h, d_w] = size(dst);

if s_h~=d_h | s_w~=d_w,
    error('the image dimension does not match!!');
end;

mse = mean2((src-dst).^2);

psnr = 20*log10(255/sqrt(mse));
```