Appendix : Haralick texture features

$f_1 = \sum_{i=1}^{N_g} \sum_{j=1}^{N_g} p^2(i,j)$	Angular Second Moment (ASM) - a measure of homogeneity of the image
$f_2 = \sum_{k=0}^{N_g-1} k^2 p_{x-y}(k)$	Contrast (CON) - a difference moment and measures the contrast or the local variation present in an image
$f_3 = \frac{\sum_{i=1}^{N_g} \sum_{j=1}^{N_g} (ij)p(i,j) - \mu_x \mu_y}{\sigma_x \sigma_y}$	Correlation (COR) between neighboring grey tones
$f_4 = \sum_{i=1}^{N_g} \sum_{j=1}^{N_g} (i-\mu)^2 p(i,j)$	Sum of Squares: Variance
$f_5 = \sum_{i=1}^{N_g} \sum_{j=1}^{N_g} \frac{1}{1+(i-j)^2} p(i,j)$	Inverse Difference Moment
$f_6 = \sum_{i=2}^{2N_g} i p_{x+y}(i)$	Sum Average
$f_7 = \sum_{i=2}^{2N_g} (i - f_8)^2 p_{x+y}(i)$	Sum Variance
$f_8 = -\sum_{i=2}^{2N_g} p_{x+y}(i) log(p_{x+y}(i))$	Sum Entropy
$f_9 = HXY = -\sum_{i=1}^{N_g} \sum_{j=1}^{N_g} p(i,j) log(p(i,j))$	Entropy (ENT)
$f_{10} =$ variance of p_{x-y}	Difference Variance
$f_{11} = -\sum_{i=0}^{N_g-1} p_{x-y}(i) log(p_{x-y}(i))$	Difference Entropy
$f_{12} = \frac{HXY - HXY1}{max(HX, HY)}$	Information Measure of Correlation
$f_{13} = \sqrt{1 - exp(-2(HXY2 - HXY))}$	Information Measure of Correlation
$f_{14} = (\text{Second largest value of Q})^{1/2}$	Maximal Correlation Coefficient $Q(i,j) = \sum_k \frac{p(i,k)p(j,k)}{p_x(i)p_y(k)}$

Notation

N_g Number of distinct grey levels in the quantized image

$$R = \sum_{i=1}^{N_g} \sum_{j=1}^{N_g} P(i,j)$$ Number of neighboring resolution cell pairs

$$p(i,j) = \frac{P(i,j)}{R}$$ $(i,j)th$ entry in a normalized gray-tone cooccurrence matrix

$$p_x(i) = \sum_{j=1}^{N_g} p(i,j)$$ ith entry in the marginal-probability matrix obtained by summing the rows of $p(i,j)$

$$p_y(j) = \sum_{i=1}^{N_g} p(i,j)$$

$$p_{x+y}(k) = \sum_{i=1}^{N_g} \sum_{j=1}^{N_g} p(i,j) \qquad i+j=k \text{ and } k=2,3,...,2N_g$$

$$p_{x-y}(k) = \sum_{i=1}^{N_g} \sum_{j=1}^{N_g} p(i,j) \qquad |i-j|=k \text{ and } k=0,1,...,N_g-1$$

$$HXY1 = -\sum_{i=1}^{N_g} \sum_{j=1}^{N_g} p(i,j) log(p_x(i)p_y(j))$$

$$HXY2 = -\sum_{i=1}^{N_g} \sum_{j=1}^{N_g} p_x(i)p_y(j) log(p_x(i)p_y(j))$$

$$\mu_x = \sum_{i=1}^{N_g} \sum_{j=1}^{N_g} ip(i,j)$$ Mean value of the $p_x(i)$

$$\mu_y = \sum_{i=1}^{N_g} \sum_{j=1}^{N_g} jp(i,j)$$ Mean value of the $p_y(j)$

$$\sigma_x = \left\{ \sum_{i=1}^{N_g} \sum_{j=1}^{N_g} i^2 p(i,j) - (\sum_{i=1}^{N_g} \sum_{j=1}^{N_g} ip(i,j))^2 \right\}^{1/2}$$ Standard deviation of the $p_x(i)$

$$\sigma_y = \left\{ \sum_{i=1}^{N_g} \sum_{j=1}^{N_g} j^2 p(i,j) - (\sum_{i=1}^{N_g} \sum_{j=1}^{N_g} jp(i,j))^2 \right\}^{1/2}$$ Standard deviation of the $p_y(j)$