Law's Texture

Watch this space.

Normalizing the GLCM

For a $K \times K$ matrix. The term $P(i, j)$ is the ijth term of G divided by the sum of the elements of G

Histogram

Essentially tally up the number of occurrences of each gray-level value in the image.

Quantization

Reduce the number of gray-levels by placing a range of values in a bin. Doing this you can reduce a 256×256 GLCM to a 8×8. This can increase performance and makes it easier to work with sequences of images.

Variance

This feature puts relatively high weights on the elements that differ from the average value of $P(i, j)$. GLCM Variance uses the GLCM, therefore it deals specifically with the dispersion around the mean of combinations of reference and neighbor pixels, encoding contextual (2. order) information. Using i or j gives the same result since the GLCM is symmetric. Note that the contextualness is an integral part of this measure; one can measure the variance in pixels in one direction. Thus it is not the same as 1. order statistic variance.

$$\sum_{i=1}^{K} \sum_{j=1}^{K} (i - \mu)^2 \cdot P(i, j) \tag{1}$$

Entropy

Inhomogeneous scenes have high entropy, while a homogeneous scene has low entropy. Maximum entropy has been reached when all 2. order probabilities are equal. The maximum value is $2 \cdot log_2 \cdot G$

$$-\sum_{i=1}^{K}\sum_{j=1}^{K} P(i,j) \cdot log(P(i,j)) \tag{2}$$

Angular Second Moment

ASM is a measure of homogeneity of an image. Homogenous scene will contain a few gray levels, giving a GLCM with few but high values of $P(i,j)$. Thus the sum of squares will be high.

$$\sum_{i=1}^{K}\sum_{j=1}^{K} P(i,j)^2 \tag{3}$$

Contrast (Inertia)

This measure of contrast or local intensity variation will favor contributions from $P(i,j)$ away from the diagonal, i.e. $i \neq j$

$$\sum_{i=1}^{K}\sum_{j=1}^{K}(i-j)^2 \cdot P(i,j) \tag{4}$$

Inverse Difference Moment (Homogeneity)

IDM is also influenced by the homogeneity of the image. Because of the weighting factor $\frac{1}{1+(i-j)^2}$ IDM will get small contributions from inhomogeneous areas ($i \neq j$). The result is a low IDM value for inhomogeneous images and a relatively higher value for homogeneous images. From the book - measures spatial closeness of the distribution of elements in G to the diagonal.

$$\sum_{i=1}^{K}\sum_{j=1}^{K} \frac{1}{1+(i-j)^2} \cdot P(i,j) \tag{5}$$

Correlation

A measure of how correlated a pixel is to its neighbor over the entire image. Range of values is 1 to -1, corresponding to perfect positive and perfect negative correlations. This measure is not defined if either standard deviation is zero.

$$\sum_{i=1}^{K}\sum_{j=1}^{K}\frac{(i-\mu_i)(j-\mu_j)P(i,j)}{\sigma_i^2\sigma_j^2} \tag{6}$$