LA-SS Project Week 1-2
10th September 2015

Mathematical Model Of Representing An Image In Algebra

• We Can Represent Image As 2D Objects, where the data is in 3D Matrix. The 2D continuous image is divided into M rows and N columns and the intersection of a row and a column is termed as a Pixel. The value assigned to the integer coordinates $[m, n]$ with $m = 0, 1, 2, , (M - 1)$ and $n = 0, 1, 2, , (N - 1)$ is a[m,n].

$$0 < f(x, y) < \infty$$
$$f(x, y) = i(x, y) * r(x, y)$$
$$0 < i(x, y) < \infty \text{ where, } i(x, y) \text{ is Illumination}$$
$$0 < r(x, y) < 1 \text{ where, } r(x, y) \text{ is Reflection}$$

$$P = \begin{bmatrix} f(0,0) & \cdots & f(0, N-1) \\ \vdots & \ddots & \vdots \\ f(M-1, 0) & \cdots & f(M-1, N-1) \end{bmatrix}$$

•This Image Can Be Represented As A Matrix By Placing The RGB Values Of Each Pixel In The Matrix.
• RGB Matrix Representation:By the process of quantization we obtain the RGB value of the discrete image.The red, green and blue use 8 bits each, which have integer values from 0 to 255. This makes $256*256*256 = 16777216$ possible colors.
• GrayScale Representation: $GrayScale = 0.299 * R + 0.587 * G + 0.144 * B$
•Pixel value range lies between 0 to 255
• Binary Image Representation: Image pixel value is only 0 and 1
•We can represent signal in continuous space and discrete space.We are sampling an image from continuous space to discrete space.

Image Processing Techniques

Techniques	Description
Enhencement	Image looks more visible
Convolution	Highpass filter-Emphasizes regions with rapid intensity changes.
Math processes	Dilation-Morphological operation expanding bright regions of image.
Noise Filters	Median filter eliminating intensity spikes.
Edge detection	First difference-Subtracts intensities of adjacent pixels. Emphasizes noise as well as desired changes.
Image analysis	Image extraction-Extracts a portion or all of an image and creates a new image with the selected area.Images statistics-Calculates the maximum, minimum, average, standard deviation, variance, median, and mean-square intensities of the image data.

Choice Of Tools

• OpenCv with JAVA