Digital Image Contrast Enhancement Using Normalization Techniques

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ABSTRACT---- *An image is an 2-d rectilinear array of pixels.An image is an Two-Dimensional function f(x,y),where x and y are spatial co-ordinates called the intensity of the image.If x ,y and f are finite and discrete quantities,we call a image as Digital image .It is composed of pixels and has particular direction and value.This paper describes the methods of processing an image.Finally ,Background Normalization techniques are applied for normalizing pixel intensities of a gray scale document images and also two new approaches are proposed for increasing readability and preserving the original look.*

Keywords--- -*scan line view,Threshold,SEB pixel level, color bleaching transform, pivoting transform, Histogram.*
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1. INTRODUCTION

Background normalization method is used to enhance the gray scale document images. It uses one of two models: a) Piece wise linear models) Non-linear models. Images are damaged to physical deteorization.To solve the contrast between foreground and background images, two direst transforms are designed .to enhance the contrast histogram normalization is applied at the background. The background normalization enhances the image, making it more legible to the eye as well as facilitating segmentation of the text from the non-text background. This approach utilize as much information as possible from the color image and convert the color image to an enhanced gray scale image with significantly improved readability.

2. BACKGROUND NORMALIZATION

This approach normalizes the background of the document image with respect to the background pixel intensities adjustment. Scanline view of digital image with respect to threshold.
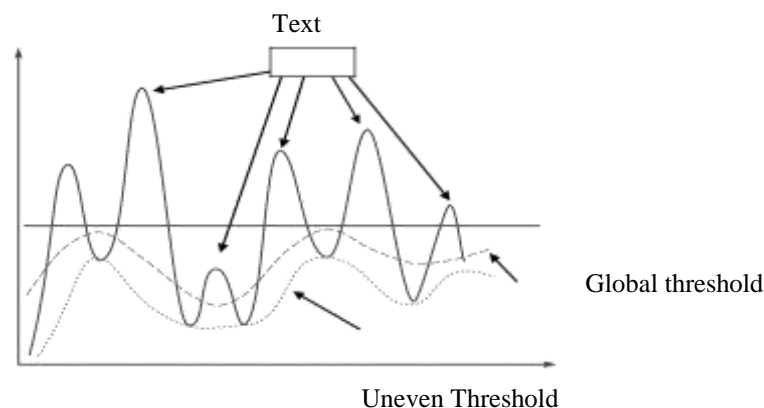
2.1 Piece-wise Linear Model

Global thresholding algorithms are divided as foreground and background. Let us treat an image as a three-dimensional object whose positional coordinates are in the *x-y* plane and the pixel gray values are in the *z* plane.Consider the extreme case when a document image does not include any textual content. Then the image merely represents the paper surface. The traditional threshold applied to this image should ⁻and a plane *H* parallel to the *x-y* plane above the paper surface. The plane H should be very close to the Surface.
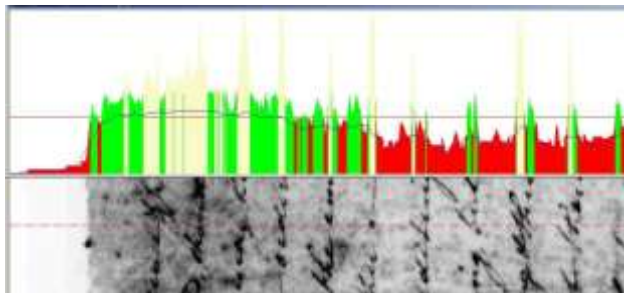

Minimal sum of distances,

$$\min_i (Ax_i + By_i \text{ } z_i + D)^2$$

Settting Derivative functions to zero,
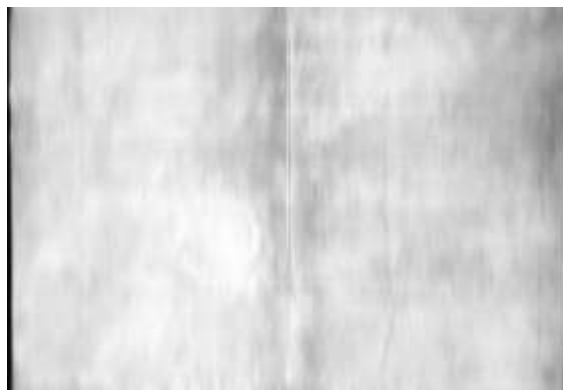
$$z = Ax + By + D$$

,for each pixel located to x,y.

It exhibits tile like Pattern due to square partition of image.

2.2 Non-Linear Model

Histogram exhibits higher variation at text locations.scan the scanline from left to right.SEB pixel levels on the scanline.Sliding Window is one of the approach.approximate background level is computed from average of SEB values.

3. IMAGE NORMALIZATION

Pixels in grayscale [2] are adjusted using non-linear approximations. Two-ways to adjust the Pixels.

3.1 Translation

Normalized pixel value is computed by,

$$n = Z_o \, j \, Z_b + c$$

Where,

$$Z_b = Ax + By + D$$

3.2 Stretching

Pixel value is computed by,

$$Z_n = (Z_o / Z_b) \, C,$$

Where c is constant. C is assumed as 255 for background color white.

3.3 Color Images

A color document image such as a historical palm leaf manuscript image is often represented in by multiple arrays that are called component channels in a color system.RGB color represented by three channels.Red ,Green and Blue.

4. TRANSFORMS

OCR techniques requoire a binary image of characters or words for recognition, converting a color document image to a gray scale image with high quality is critical as a pre-processing step for binarization.

4.1 Pre-dominant color Projection

The simplest way of determining the background color is by calculating a color histogram. Our assumption is that the most dominant colors from a leaf are from the background. We ¯rst locate a range for the most frequently occurring colors on a leaf, then take the mean of the colors in the range as our background base color.

After calculating the base background color as $(r_0; g_0; b_0)$, we design a linear model in terms of the following transform:

$$L = R \cent r_0 + G \cent g_0 + B \cent b_0$$

This transforms the background colors to a range around number 3. Re-scaling by a factor of 88, the background colors are transposed to a range near 255.
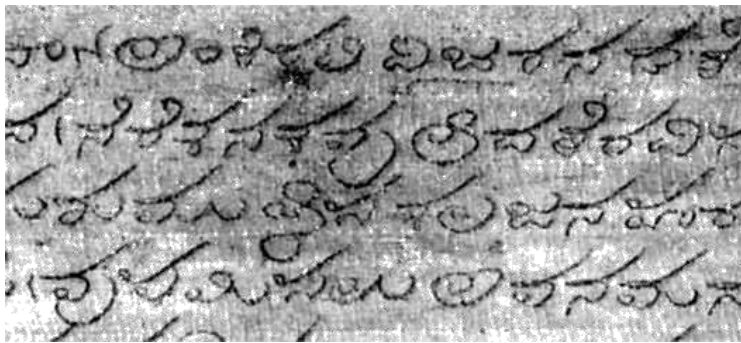
4.2 Pivoting Color Bleaching Transform

Dynamically determined background color r0, g0, b0 is

$$L = \frac{R}{r0} + \frac{G}{g0} + \frac{B}{b0}$$

This transforms the background colors to a range around number 3. Re-scaling by a factor of 88, the background colors are transposed to a range near 255. This moves all the other darker colors to lower levels and colors lighter than the background are transformed to have values greater than 255. A transformed grey-scale image is constructed by truncating the above values at corresponding pixel positions to the normal range of 0 to 255.

*Color bleaching Transform*

5. HISTOGRAM NORMALIZATION

A grey scale bright image is created from original color image using transforms. Histogram Normalization algorithm is applied to enhance the contrast. Pixel value ranges from   0 to 255.This normalization technique enhances greater flexibility in attracting the images [4]. It is the latest method in enhancing the contrast and also the brightness of the image.
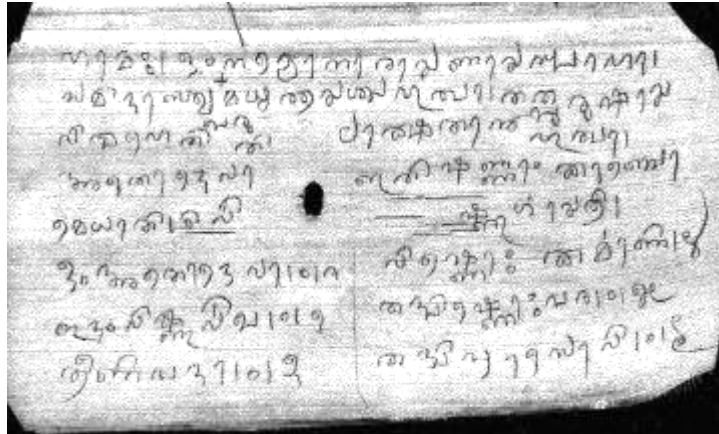

6. DEMONSTRATION

One of the goals of automatic document segmentation is to facilitate document OCR, and we propose to test the performance of in-house OCR systems[6] on papyrus and aged paper documents containing Roman character text processed using the segmentation techniques proposed in this work. A longer term objective is to also process palm leaf manuscripts in Indic scripts using Indic OCR systems currently under development.

Binary image is obtained using simple global threshold method.
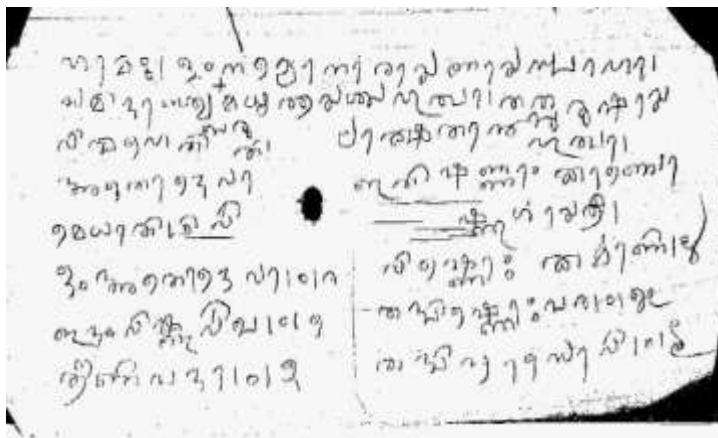
By applying the above algorithms such as background approximation, linear and Non-Linear models the blurred texts of the images are improved .By experimenting the Histogram Method the text of the image is clear and understandable.
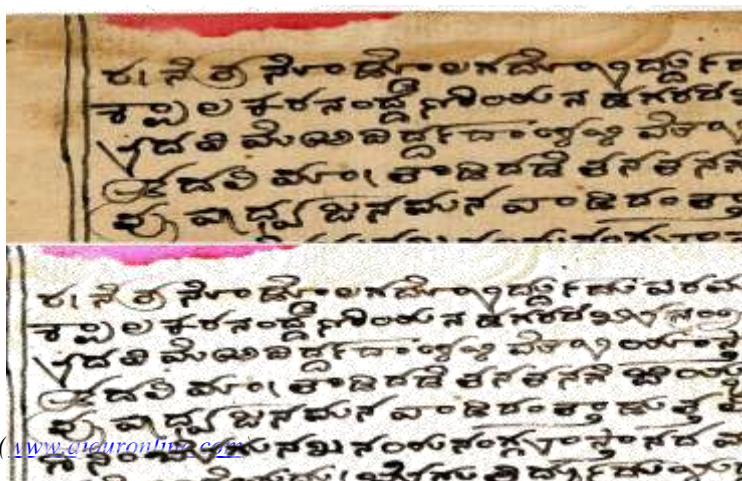
7. COMPARISON OF CONTRAST ENHANCEMENT OF MAMMOGRAMS

(a) Original mammogram.
(b) Enhanced through histogram equalization.
(c) Enhanced through adaptive histogram equalization.
(d) Enhanced through nonlinear multiscale processing based on Laplace pyramid.
(e) Enhanced through the method based on wavelet transform and morphology.
(f) Enhanced through the proposed method.
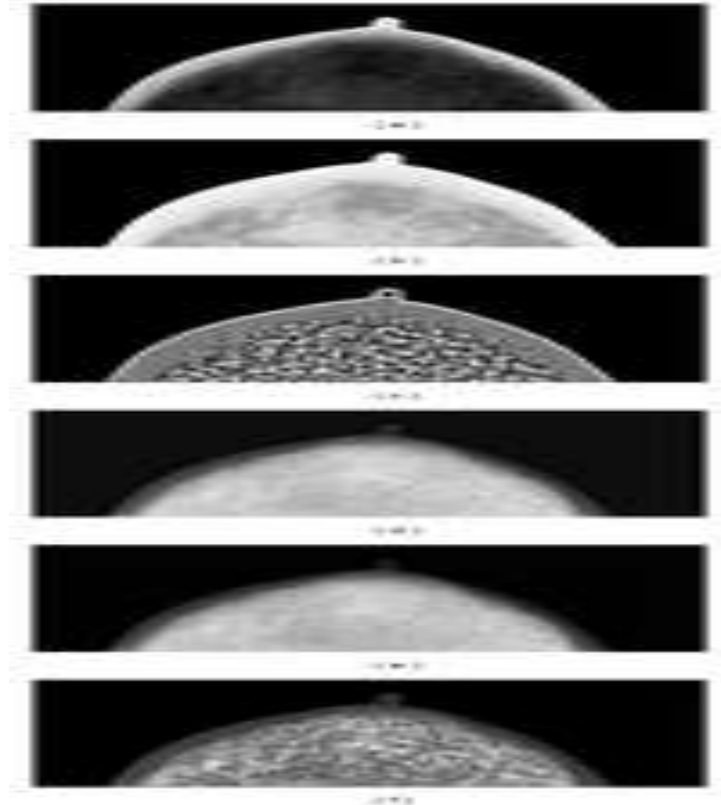
8. CONCLUSION

Image enhancement methods are discussed in detail here.The Various normalization algorithmic models computed .Old Manuscript images are also collected and research can be done to exchange the messages without damage of text .This study concluded that thresholding methods produces good result
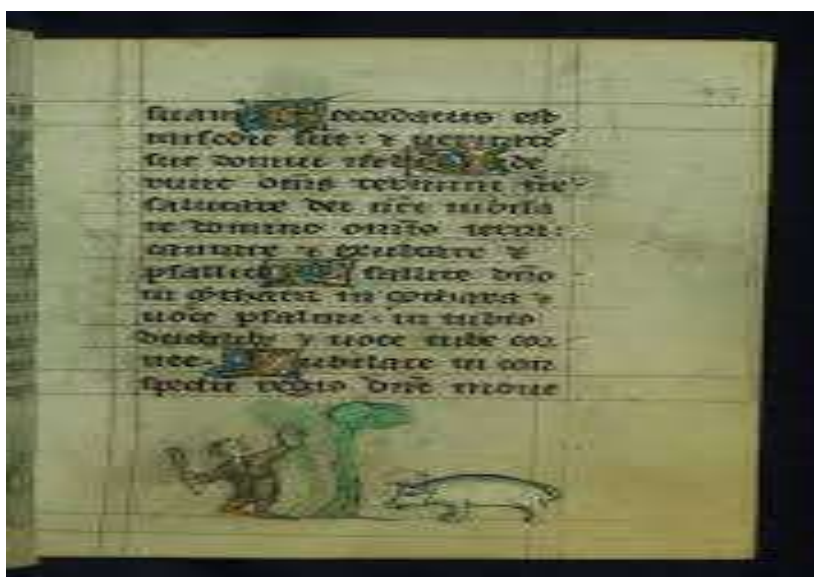
Background Normalization not only improves readability and clarity and also satisfy look and feel of the original image.Color image to grayscale conversion algorithms generate improved gray scale image.Degraded images can also be improved by experimenting above algorithms.Degraded text images are retrieved using histogram technique.

9. REFERENCES

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