BLIND DECONVOLATION ALGORITHM IMPLEMENTATION ON IMAGE DEBLURRING USING PARLLEL AND DISTRIBUTED COMPUTING

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Abstract – **The goal of image restoration is to restore degraded image. Although classical image restoration has been thoroughly studied but no one conceived it using the segmented part of a single image. Blind image deblurring is process of retrieving the approximate image by the degraded image. In blind image restoration, the blurring function is unknown and the process of restoration is executed after numbers of iterations. We pose a novel algorithm for blind image deblurring from a single image using image segmentation. We divide the image and exert the algorithm on each segmented part .**

Keywords: - **Blind Image Deconvolution, Degradation, Point spread function (PSF)**

I INTRODUCTION

The field of image restoration is concerned with the reconstruction or estimation of an uncorrupted image from a distorted and noisy one. It is important in fields such as astronomy, where resolution and recording limitations are severe, for enhancing historically important photographs, and for analyzing images of unique events such as medical images, satellite photographs, and the result of scientific experiments. In recent years the commercial photographic industry has also shown an interest in consumer applications of image restorationImage deblurring is an inverse problem which whose aspire is to recover an image which has suffered from linear degradation. The blurring degradation can be spaceinvariant or space-in variant. Image deblurring methods can be divided into two classes: nonblind, in which the blurringoperator is known. And blind, in which the blurring operator is unknown.
Blurring is a form of bandwidth reduction of the image due to imperfect image formation process. It can be caused by relative motion between camera and original image.

Normally, an image can be degraded using low-pass filters and its noise. This low-pass filter is used to blur/smooth the image using certain functions. Image restoration is to improve the quality of the degraded image. It is used to recover an image from distortions to its original image. It is an objective process which removes the effects of sensing environment. It is the process of recovering the original scene image from a degraded or observed image using knowledge about its nature. There are two broad categories of image restoration concept such as Image Deconvolution and Blind

In blind image deblurring (BID), not only the degradation operator is ill-conditioned, but the problem also is, inherently, severely ill-posed: there is an infinite number of solutions (original image + blurring filter) that are compatible with the degraded image. For an overview of BID methods, see [6] and [7]. The advantages of Deconvolution are higher resolution and better quality [4].

This paper is structured as follows: Section 2 represents segmentation of an image. Section 3 describes the degradation model for blurring an image. Section 4 describes the deblurring algorithm and overall architecture of this paper. Section 5 describes the sample results for deblurred images using our proposed algorithm. Section 6 describes the conclusion, comparison and future work.

II SEGMENTATION

The image is partitioned into smaller frames each of which is large enough to contain information for kernel estimation. Since our blur is uniform so we can process each part individually and estimate the N and K .The whole image will contain same information

Image Model for kernel assessment assuming uniform blur distribution avoiding non linearity.

a. $G(x, y) = k(x, y)*f(x, y) + n(x, y)$ (1)

b. Discrete Fourier transform can be used to yield frequency domain model

$G(m,n) = K(m,n)*F(m,n)+N(m,n)$ (2)

where m and n discrete horizontal and vertical frequency variable.

c. Inverse procedure will compute

$G(m,n)K\text{-}1(m,n)=F(m,n)+N(m,n)k\text{-}1(m,n)$ (3)

The following model, after partition holds approximately:

$G_i(x,y)=K(x,y)F_i(x,y)+N_i(x,y);_i = 1,2,3\ldots n_p$ (4)

where n_p is the total number of partitioned subsections.

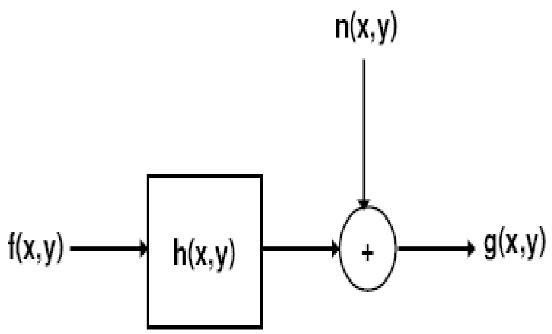

Fig. 1: Image Degradation Model

A) *Algorithm for Image Quantization*

Input:
Load an input image 'I'.
Initialize row value.
Initialize column value.
Procedure – I
  Load an input image I
  Partition the input image I

$G_i\,(x,y) = K\,(x,y)\,F_i\,(x,y) + N_i\,(x,y);\ _i = 1,2,3\ldots\ldots n_p$

Go to Procedure – II
End Procedure – I

III. DEGRADATION MODEL

In the model of image degradation [5]fig. 1, the observed image g(x, y) can be characterized by its degradation function f(x, y). The noise n(x, y) is assumed to be a Gaussian white noise with zero mean. If the degradation function f(x, y) is linear and space invariant function, then the observed blurred/noisy image in spatial domain is given by

$$G(x, y) = k(x, y)*f(x, y) + n(x, y) \qquad (5)$$

B) *Algorithm for Degradation Model*

Input:
Load an input image 'I'
Initialize blur length 'l'
Initialize blur angle 'theta'
Assign the type of noise 'n'
PSF (Point Spread Function), 'F'
Procedure – II
h=create (I, l, theta) %Creation of PSF
Blurred image (B) = I*F + n
B= filter (I, f, n,"convolution")
Go to Procedure – III
End Procedure – II

IV. OVERALL ARCHITECTURE AND DEBLURRING ALGORITHM

The following Fig. 2 represents the overall architecture of this paper.The original image is degraded or blurred using degradation model to produce the blurred image. The blurred image should be an input to the deblurring algorithm. Various algorithms are available for deblurring. In this paper, we are going to use blind deconvolution algorithm. The result of this algorithm produces the deblurring image which can be compared with our original image.

1) *Blind Deconvolution Algorithm:*

Blind Deconvolution Algorithm can be used effectively when no information of distortion is known. It restores image and PSF simultaneously. Definition of the blind deblurring method can be expressed by:

$$G(x, y) = h(x, y)*f(x, y) + n(x, y) \qquad (6)$$

Where: g (x, y) is the observed image, f(x,y) is Point Spread Function, h(x,y) is the constructed image and η (x,y) is the additive noise term .

C) *Algorithm for Deblurring for each frame:*

Input:
Blurred image 'B'
Initialize number of iterations 'j'
Initial PSF 'F'
Procedure – III
If PSF is not known then
Guess initial value of PSF
Else
Specify the PSF of degraded image
Restored Image I'= Deconvolution (B, F, j,G_i(x,y))
Combine all the restored images
End Procedure – III

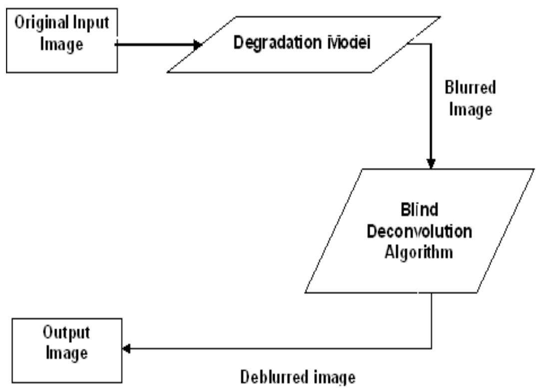

Fig. 2 Overall Architecture

Fig 3.(a) Original Image

Fig 4.(a)(b)(c)(d) Four divided Original Image

Fig 5(a)(b)(c)(d) Four divided blurred image

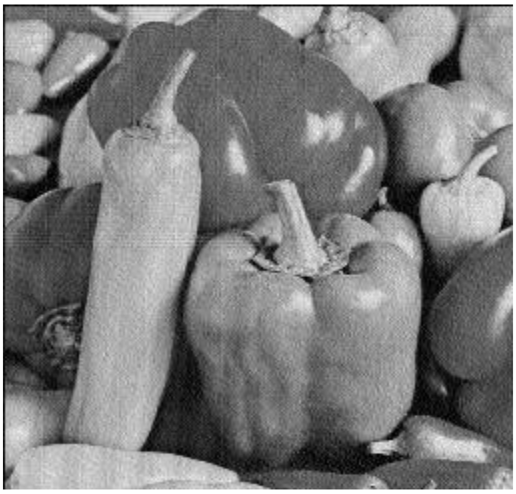

Fig 6 (a) Final image computed from our algorithm

V. SAMPLE RESULTS

The , Fig 3(a) the original image.We break the original Image and and apply different PSF on every part named A,B,C,D as shown in Fig 4 (a)(b)(c)(d).
Fig 5 (a)(b)(c)(d) is depicted as blurred images for all parts A,B,C,D.

The sample image after applying the proposed algorithm will be shown in Fig. 6 (a).

The result of our algorithm is quite promising from parallel computation view. We can compute the each part independent from each other and final result will be combination of all divided images.

VI CONCLUSION AND FUTURE WORK

This paper addresses the blind image restoration problem, Namely, given a number of different, blurred, and noisy PSF of a single ideal image, one wants to restore the original image. To solve this problem, a new segmented model is introduced. The restoration problem at hand in each of these approaches reduces to the problem of solving a multiple independent set of images on which algorithm is applied parallel. An efficient iterative two-phase algorithm is presented for solving the defined problem, and convergence is assured to the optimal point.

The future work of this paper is to increase the speed of the deblurring process that is reducing the number of iteration using for deblurring the image for achieving better quality image.

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