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Probabilistic Recovery Filling-in Technique for Image Restoration

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Abstract— Image Restoration means to restore a degraded/distorted image to its original content and quality. Many restoration methods are available and implemented for recovery of the corrupted images. Filling-in of missing information is a very important technique in image processing. While transmission of image if some blocks of image are lost then instead of using common retransmission query protocols, reconstruction of the lost data using correlation between the lost block and its neighbors has been used. The basic idea is fill-in the missing block with the information propagating from the surrounding pixels. In this paper, "Probabilistic Recovery Filling-In Technique for Image Restoration" which will find the corrupted and missing pixels and the probability of recovery on particular pixel is proposed. For corrupted pixels, if probability of recovery of pixel is < 60 % then matching of the pixel from surrounding will be done. If recovery probability of corrupted pixel is >60%, then matching of the pixel will be done with the remaining part of that particular pixel. For completely missing pixels, finding the missing block process will be carried and matching with surrounding is good option in this case. The research will provide better quality of image after recovery.

Keywords— Digital Image Restoration, Filling Pixels, Density, RGB.

I. INTRODUCTION

An image is a 2-D function f(x, y) where x and y are called spatial coordinates. Amplitude of f at any pair of coordinates is called intensity or gray level of image. When x, y and intensity value of f are finite and discrete image is called digital image**.** Digital Image Processing (DIP**)** refers to the process of processing digital images by means of digital computer. Image processing basically includes the following three steps. - Importing the image with optical scanner or by digital photography, analyzing and manipulating the image which includes data compression and image enhancement and restoration[3] .Output is the last stage in which result can be altered image or report that is based on image analysis .

Image processing is a wide area including various applications in it. Since the early days of art and photography, filling-in and in painting has been done by professional artist. Imitating their performance with semi-automatic digital techniques is currently an active area of research. The filling-in of missing information with applications including image coding and wireless image transmission (e.g., recovering lost blocks), special effects (e.g., removal of objects), and image restoration (e.g., scratch removal) is a very important in image processing [2].

Image Restoration means to restore a degraded/distorted image to its original content and quality. The main objective of restoration is to improve the quality of a digital image which has been degraded due to various phenomena like motion, improper focusing of camera during image acquisition, atmospheric turbulence and noise. Before the advent of computers and software such as Photoshop, most photo restoration was done by restoration experts such as museum art restorers. Repairs were applied directly to the damaged photo and consisted mainly of air brushing over the damage. This is still the preferred method for valuable historical photos such as those found in archival collections. This type of work is very expensive and not usually required by the average person wishing to repair old damaged family photos. Fortunately, it is now possible through the use of computers and software, to restore almost any photo at very reasonable prices. Instead of working directly on the damaged photo, a copy is made using a scanner [2]. Once all repairs are made to the copy using computer software, a new print can be produced. The final digital photo file of the repaired photo can be saved as an archival copy and replaces the need for a negative.

It is a good idea to restore your entire photo collection in order to stop the unavoidable destruction that will take place no matter how carefully the photos are stored. Once restored, the photos can be copied to CD or DVD for long term storage and safe keeping. Once you have digital copies you need not worry about further damage because digital images do not change at all [2].

The **Filling-In Technique** for restoration uses the information propagating from the surrounding pixels. Here the aim is to fill-in the gap of missing data in a form that is non-detectable by an ordinary observer and is known as in-painting [9]. This technique provides a means to restore damaged region of an image, such that the image looks complete and natural after restoration [4]. Filling-in missing data in digital images has a number of fundamental applications. They range from

removing objects from a scene all the way to retouching damaged paintings and photographs [1]. Since the early days of art and photography, filling-in and in- painting has been done by professional artist. Imitating their performance with semi-automatic digital techniques is currently an active area of research.

Image in-painting provides a means to restore damaged region of an image, such that the image looks complete and natural after the in-painting process. Image in-painting could also be used to create special effects, for instance specific object removal. Digital image in painting mainly aims at filling in missing pixels in an unknown region of an image in a visually plausible way.

II. PROPOSED WORK

In this paper**,** we focus on restoration of both corrupted and missing pixels. Corrupted and missing regions will be detected according to the density of the pixels. Image Restoration will then be done using Probabilistic Recovery Filling-In Technique, i.e. for corrupted pixels; if probability of recovery of pixel is < 60 % then we will go for matching the pixel from surrounding. If recovery probability is >60% then we will match the pixel with remaining part of that particular pixel. This strategy will provide better quality than matching with surrounding for filling in the gaps. In case of completely missing pixels, finding the missing block process will be carried and matching with surrounding is good option in this case. Copying process will be used for missing pixels to recover the image. The research will provide better quality of image after recovery.

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III. METHODOLOGY

In this paper, corrupted region and missing regions will be detected according to the density of the pixels, as low density will detect the missing or corrupted areas**.** For corrupted pixels, if probability of recovery of pixel is < 60 % then we will go for matching the pixel from surrounding. If recovery probability is >60% then we will match the pixel with remaining part of that particular pixel. For completely missing pixels, finding the missing block process will be carried and matching with surrounding is good option in that case. Pixel matching will be judged by color map and based on good observations.

The reconstruction of lost blocks follows three computationally efficient steps-

a) Mark the region to be filled;

b) Search for the best matching pixel;

c) Copy the selected pixel to proper position of the target area in current filling block.

The first step is to take the input missing block image and then mark the target region to be filled i.e. missing block region. Once the missing block region is found, then the next step is to search for the best matching pixel from the surrounding area. After finding the best matching pixel, we copy that pixel to the proper position of target area in current filling block. We repeat this process for all the missing blocks. After finishing the filling process we generate the output image.

IV. EXPERIMENTATION

Our initial work starts with selecting images from database and converting it to the gray scale.

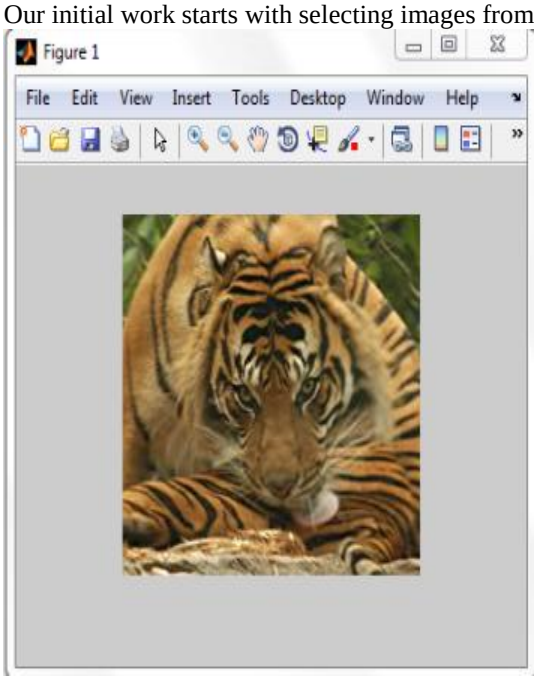

Fig 1: Basic Image without any operation

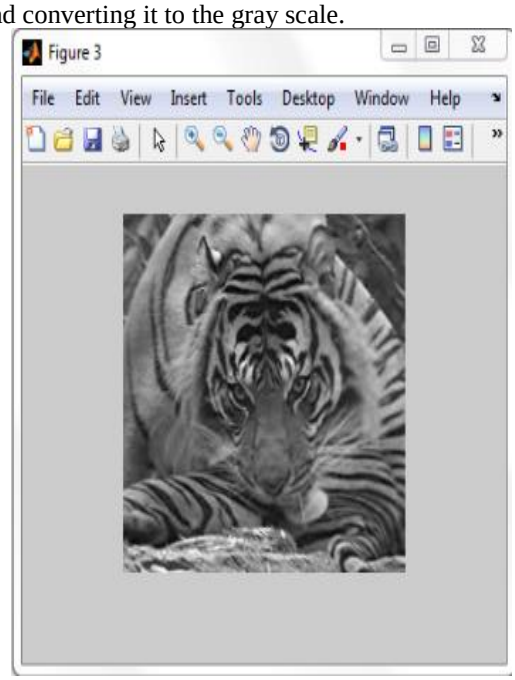

Fig 2: Image after basic grayscale operation

Further we have done some noise removal by implementing the canny edge detection smoothing techniques. Our initial experimentation is based on converting Red Green Blue in Gray Scale. Function rgb2gray is used for initial process.

CONCLUSION

In our continuous research we are working on image restoration with refined filling in technique. We have done some initial experimentation and we are working on further process of finding density and will proceed with defined work.

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