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A Review on Reflection Removal from Images.

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Abstract – *Reflection from images is major cause for quality degradation of images in image processing. Flash is often used to capture a good photograph of a scene under low light conditions. But flash images have many problems: reflection of object and stronger highlight. Selection of the most suitable algorithm or method is a matter of prime importance in removing artifacts. To reduce this quality degradation caused by reflection, gradient projection (GP) method is used. Gradient projection plays an important role in removing artifacts from the images.*

Key Words: ***flash, reflection removal, gradient projection***

1. INTRODUCTION

Image processing is a technique to enhance the image and to remove artifacts from images. It is used in many fields like medical, textiles, military, printing industry etc. If is taken through a glass window then picture is viewed through transparent glass or a photograph the image consist of two parts, first one is the real image of the scene beyond the glass and second is virtual image of the scene reflected by the glass window. Decomposing of the single input image from the reflection is a massive ill posed problem. [1] Similarly photographs taken under low-light conditions also produce a variety of undesirable effects and artifacts. They tend to saturate nearby objects while failing to light up distant ones. Since the flash intensity falls with distance from the camera, flash produces a tunnel effect, where brightness decreases quickly with depth. Furthermore, flash is widely known for producing undesirable reflections. Direct reflection of the flash itself is caused by glossy objects in the scene. Because of the artifacts, it causes an error in image processing, due to the absence of additional knowledge about the scene. It becomes necessary to remove artifacts, before processing the image in artifacts removal process. Flash and no flash images are used to produce better flash images. Gradient projection method is used to remove reflection and highlights from an image. A gradient orientation coherence model, relates gradients in the flash and ambient images, and tries to capture the properties of image gradients that remain invariant under the change of lighting that takes place between a flash and an ambient image. Based on a gradient projection method it is possible to remove the component of image gradients that are introduced by undesirable reflections. Gradient coherence model [2] is used as a guide, to combine the gradients of flashed image and without flashed image.

2. Literature review

Yu Li [3] When the picture is taken which is behind the glass surface, reflections are occurs. In this paper SIFT (scale invariant feature transforms) flow is used to produce good results. For this approach images are taken with a slightly different point of view. From this set of images they got minor changes in the reflection. SIFT flow is used to align the images for pixel wise comparison across input set. Gradients with variation across the image set are assumed to belong to the reflected scenes while constant gradients are assumed to belong to the desired background scene. Then by giving appropriate labels to the gradients which belongs to reflection and background. Reflection interference is taken separated from background scene.

B.himabindu [4] proposes a new technique for removal of shadow and reflections in the images. In this paper cross projection tensor technique is used edge suppression with affine transformation on gradient fields. Affine transformation is a linear mapping method that preserves points, straight lines and planes. Sets of parallel lines remain parallel after an affine transformation. Cross projection tensor technique remove the scene texture edges of an image by transforming the gradient field. Flash and ambient image is used. Cross projection tensor is obtain from flash image and transform the gradient field of ambient image in it. Here no need for color calibration to handle color images.

Mário A. T. Figueiredo [5] has proposes gradient projection algorithm for the bound constrained quadratic programming formulation. BCQP approach also requires only matrix vector products. At the initial stage gradient projection is applied to a quadratic programming formulation. This is referring as a GPSR (gradient projection for sparse reconstruction). Key step for this approach is to express the convex unconstrained optimization problem as a quadratic program. They use a linear CG method to minimize the least squares cost of the inverse problem, under the constraint that the zero components of the sparse estimate produced by the GP algorithm remain at zero.

A.Levin [6] proposed the search is performed using belief propagation on a patch representation of the image. Two photographs of the same scene were taken with a different polarizing filter. They used an algorithm that can decompose reflections images using a single input image and

without any high level knowledge. The algorithm is based on a simple function that is decomposition which has a small number of edges and corners. This is a very simple cost function. It gives the "right" decompositions for challenging real images. Total number of edges and corners are minimized by decomposition.

Song,Bo; Gong,shenwen; Ren,chunjian [7] used only single image to remove artifacts from image. Due to the image de-convolution image ringing artifacts arises. Image de-convolution algorithm is used for the motion blurred images. Poisson interpolation is used to remove artifacts from blurred image. In this paper only one image is used known as source image. As gradient projection method is used it needs another image which is taken from source image by de-blurring it known as blurred image. Then gradient projection method is used to adjust the gradients with source image. Finally Poisson equation is used to reconstruct the image.

Aseem Agarwala et al. [8] proposed to utilize multiple photos of a scene, taken with a digital camera, in which some aspect of the scene or camera parameters varies with each photo. These photographs are then pieced together, via an interactive system, to create a single photograph that better conveys the photographer's subjective perception of the scene. This process is known as digital photomontage, after the traditional procvariety of photographs to form a composite picture, known as photomontage. Gradient domain fusion which is based on Poisson equation to remove visible artifacts that remains after image seams are joined.

Yilong Geng [9] proposes phone app to take two images, specially designed for smart phones. In this paper flash and ambient image is used. First find out position of flash and size of a flash in the flash image. To find out hot spot in flash image template matching and connected component method is used. Input images are taken from different angles so before combining them there is need to align them together. For this operation SIFT descriptor is used with RANSC. Then color transformation resolves the color inconsistency in two pictures caused by different lighting sources.

Georg Petschnigg et al. [10] have made it possible for images taken under low light conditions. Flash and without flash image is used. Flash image is used to capture details from image and without flash to capture ambient illumination. Ambient image de-noising technique is useful for the relatively noise-free flash Image. It reduces noise in the no-flash image. Flash-to-ambient detail transfer is used because high-frequency details are not exists in the original ambient image. Signal to noise ratio is used for the high frequency details. Acquisition procedure is used to ensure that flash and without flash image is captured with the same points in the scene. White balancing is used to see scene under a white illuminant. And red-eye removal is to repair artifacts in the flash image.

3. CONCLUSION

So many methods are available to remove artifacts, reflection, shadow etc from the images. The methods are scale invariant feature transforms, cross projection tensor analysis, gradient projection algorithm for the bound constrained quadratic programming formulation are available. In some cases only one image is used and sometimes flash and ambient image is used. Among them gradient projection method is widely used.

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