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Multi Light Exposure Image Fusion for High Dynamic Range Imaging

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Abstract

The proposed methodology of multi light intensity image fusion of the single image for high dynamic range imaging uses four to five input images with different light exposure time interval of the single same image with different time interval at the same time the aperture of the camera is fixed the resulting method gives the high dynamic range image as well as overcomes the displacement of pixel in motion images, underexposure and overexposure pixels in image and allow to calculate the possible luminance value of every pixel in an image using maximum Posterior Estimation (MAP) technique and reduce the noise in an image using proposed work method we can obtain more informative and high quality image than used input different light exposure images of single image. Using contrast stretching and histograms in contrast stretching the intensity of the pixel is estimated

Keywords: Image Fusion, High Dynamic Range Images (HDRI), Histogram Stretching, Multiple Exposure, MAP-MRF Technique.

1] INTRODUCTION

The digital devices being used to capture images are not achieve the wide dynamic range of luminosity or irradiance of an image as captured by human eyes human vision system has high perceptional range. There are HDR sensors too to capture wide range of irradiance from static scenes or natural scenes and store it in each pixel for eg. Night vision cameras, robotic eye etc. But there are some problems occurs in this sensor applications such as blackouts and whiteouts regions and noise measurement in an underexposed and overexposed image pixels is not easier one.

To overcome such errors image based lighting method is used in order to generate high quality images .the proposed algorithm for high dynamic range imaging based on Markov Random field model monitoring Occlusion,Artifacts,whiteouts and blackouts, and noise in an images.

2] MULTIEXPOSURE FUSION

Multiple images are combined to obtain one high quality image which is more informative than input images four to five images are being fused to result one high range image. Images are captured with various exposure of light with time of single image at same time aperture is fixed. From these images one of the image which is at average exposure of light selected as a main reference image this concept considering to overcome occlusions, motion blur, underexposure and overexposure in image and noise free image.

3] METHODOLOGY TO WORK

In the proposed technique multiple light exposures five images are combined with the help of high dynamic range imaging contains five main steps of work flow as
a) input images
b) image data acquisation,
c) main reference image selection
d)MAP based estimation,
e)high dynamic range image fusion using different exposure input images.

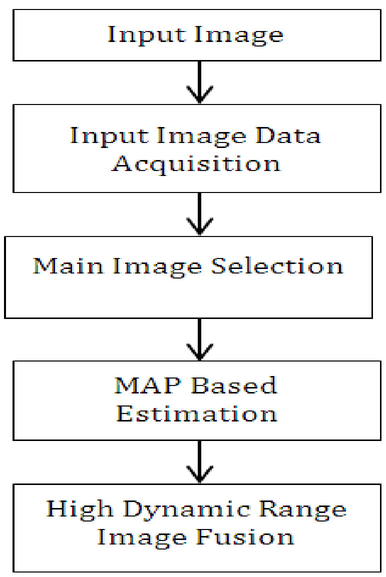

Fig:-work flow of proposed method

A) INPUT IMAGE

There are five input images are captured with different light exposure with changing shutter speed and fixed aperture.

B) IMAGE DATA ACQUISATION

In this step first to generate digital imageon paper using scanner or CCD camera resulting data is an image pixel energy value.

c) MAINREFERENCE IMAGE SELECTION

From the captured images one of the images at medium light exposure is selected as a reference image.

D) MAP BASED ESTIMATION

MAP estimation detects the occlusion regions, saturation regions, motion blurs, underexposed and overexposed pixels in an images

1. Maximum A posteriori

Vector, as well as the occlusion and saturation are detected by the MAP estimation. The estimates displacement and occlusion and saturation region by using Maximum A posteriori estimation and constructs motion blur free HDRIs.The estimates displacement and occlusion and
Saturation region by using Maximum A posteriori estimation and constructs motion blur free HDRIs. The displacement.

2. Markov Random Field

MRF construct the HDRI by taking consideration displacements underexposure and overexposure and occlusion MRF used for motion compensation. Estimate the following two classes, as well as the displacement vector. Markov Random Fields (MRF) is defined as probabilistic models over undirected graphs.

E) HIGH DYNAMIC RANGE IMAGE FUSION

High dynamic range imaging method allows a dynamic range between darkest and lightest pixels of images than the reference main image selected. Image fusion technique is a process of combining several images here are five in to one resulting fused image of all input images which is more informative than input images.

4] ALGORITHM STEPS OF METHOD

-Read input image

-Image data acquisition for image with different exposure settings

-Application of MAP estimation to main image with average exposure

-Detection of underexposed and overexposed pixel region using MAP

Fusion of image to HDR image

-Calculation of performance parameters means value, PSNR, standard deviation, etc.

5] PERFORMANCE PARAMETERS

The performance parameters are used here are for comparison of input images to be fused and the final resulting fused image.

5.1] Peak signal to noise ratio (PSNR)

PSNR is the ratio between maximum and possible power of signal and power of corrupting noise that affect fidelity, PSNR measure in dB.

$$\text{PSNR dB} = 20\log\frac{255\sqrt{3MN}}{\sqrt{\sum_{i}^{m}=1\sum_{j}^{m}=1(B(ij)-(B'(ij))^{2})}}$$

Where, B=the perfect image

B'=fused image

i=pixel row index

j=pixel column index

MN=no. of row and column

5.2] Standard Deviation

Standard deviation can be calculated using

$$S = \frac{\sqrt{\sum(X-M)^2}}{n-1}$$

Where=individual data point

M=mean of all data point

n=sample size (no.of data point)

5.3] Mean (M)

It is sum of observations divided by number of observations

$$M = \frac{\sum(X)}{N}$$

Where, x=individual data point

N=sample size

6] RESULT

Here, the main objective of this proposed work is to use five input images with changing light exposure with time while aperture is fixed. And extra high light exposure converted images to know high dark and high bright points, forming their histograms with pixel value showing high bright and high dark pixel in an image to form comparatively more informative image than input images while in comparison of photometric method with high dynamic range imaging method photo matrix method is poorer than high dynamic range imaging method noise reduction achieved in fused image as well as and reconstruction of motion blur and occlusions and saturations are achieved.

Fig:-input images having different light exposure

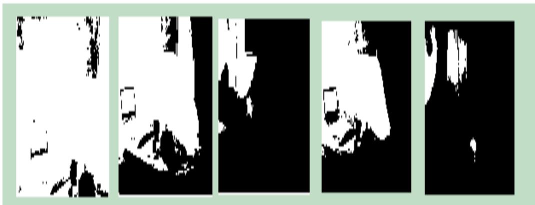

Fig:-Input Images With High Exposure

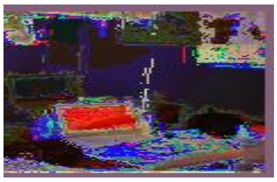

Fig:-Photo matrix Method Result

Fig:-Fusion Method Result

Table:-performance parameter

Parameter	Photo matrix	Fusion Method
Mean	0.57796	149.695
PSNR	0.2179	36.887
Mean Deviation	13.888	13.45

7] CONCLUSION

This methodology is implemented on the basis of multi light exposure on images and to produce high dynamic range image. Explaining method of combining multi exposure images and multi light exposure images fusion technique for high dynamic range imaging acquisition also estimating overexposure and underexposure region by MAP estimation and reduced motion blur and ghost artifact.

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