

# **COL783: Digital Image Analysis**

## **Assignment 1**

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### **A. Demosaicing**

Images were given in BGGR format. The Bayer image was padded with reflection padding and was convolved with filters given in Malvar et.al 2004. The padding was done to ensure the same dimension. PSNR was calculated on all three channels. The PSNR values are given below.

Image ID	PSNR on Red Channel	PSNR on Green Channel	PSNR on Blue Channel
1	38.49	41.36	38.76
2	37.72	40.68	38.57
3	32.42	35.12	32.57
4	35.28	37.82	35.10

The corresponding Images are pasted below.



Figure 1.a. ImageID#1 Original Image



Figure 1.b. ImageID#1 Bayer Image



Figure 1.c. ImageID#1 Transformed Image



Figure 2.a. ImageID#2 Original Image



Figure 2.b. ImageID#2 Bayer Image



Figure 2.c. ImageID#2 Transformed Image



Figure 3.a. ImageID#3 Original Image



Figure 3.b. ImageID#3 Bayer Image



Figure 3.c. ImageID#3 Transformed Image



Figure 4.a. ImageID#4 Original Image



Figure 4.b. ImageID#4 Bayer Image



Figure 4.b. ImageID#4 Transformed Image

## B. Image Enhancement

Adaptive Histogram Equalization was used to enhance both the night images and the foggy images. Two different transformations are shown: (i) All three channels in RGB space are equalized. (ii) Only the V channel in HSV space is equalized.

Another image clicked by our own camera is also attached in the submission zip.

The corresponding images are shown below

### 1. Night Images



Fig 5.a. Night#1 Night Mode Off



Fig 5.b. Night#1 Night Mode On



Fig 5.c. Night#1 HSV Equalization



Fig 5.d. Night#1 RGB Equalization



Fig 6.a. Night#2 Night Mode Off



Fig 6.b. Night#2 Night Mode On



Fig 6.c. Night#2 HSV Equalization



Fig 6.d. Night#2 RGB Equalization



Fig 7.a. Night#3 Night Mode Off



Fig 7.b. Night#3 Night Mode On



Fig 7.c. Night#3 HSV Equalization



Fig 7.d. Night#3 RGB Equalization



Fig 8.a. Night#Own Night Mode Off

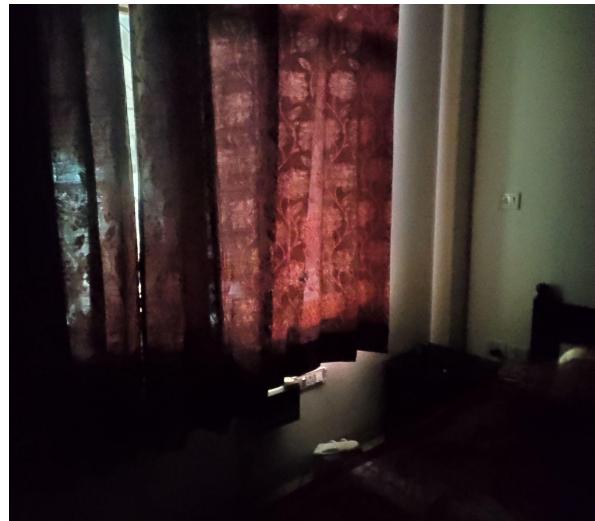


Fig 8.b. Night#Own Night Mode On

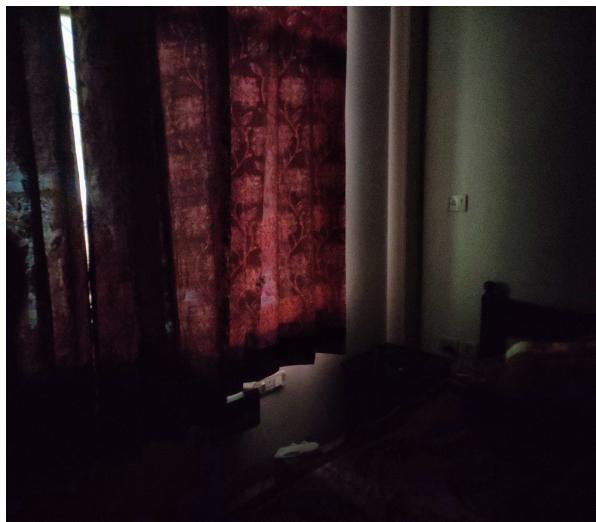


Fig 8.c. Night#Own HSV Equalization

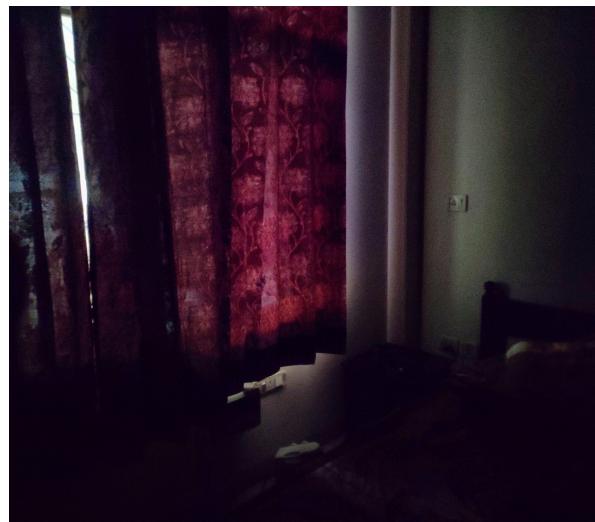


Fig 8.d. Night#Own RGB Equalization

## 2. Foggy Images



Fig 9.a. Foggy#1 Foggy Image



Fig 9.b. Foggy#1 Clear Image



Fig 9.c. Foggy#1 HSV Equalization



Fig 9.d. Foggy#1 RGB Equalization



Fig 10.a. Foggy#2 Foggy Image



Fig 10.b. Foggy#2 Clear Image



Fig 10.c. Foggy#2 HSV Equalization



Fig 10.d. Foggy#2 RGB Equalization



Fig 11.a. Foggy#3 Foggy Image



Fig 11.b. Foggy#3 Clear Image



Fig 11.c. Foggy#3 HSV Equalization



Fig 11.d. Foggy#3 RGB Equalization

## C. Video Enhancement

The video is read frame by frame and the adaptive histogram equalization(as in part B) was done on each frame via two methods: (i) All three channels in RGB space are equalized. (ii) Only the V channel in HSV space is equalized.

The videos are attached in the submission zip.

## References

- H. S. Malvar, L.-w. He, and R. Cutler, “High-quality linear interpolation for demosaicing of Bayer-patterned color images,” in 2004 IEEE International Conference on Acoustics, Speech, and Signal Processing, vol. 3. IEEE, 2004, pp. iii–485.