
山东大学

# School of Information Science and Engineering

**2019－2020 school year**

**Digital Image Processing Experiment Report**

Course Name: Digital Image Processing

Title of Experiment: Color Image Processing

Major and Class Class 3, Communication Engineering

Student ID 201600121116

Studeng Name 张子超

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## 1. Objectives:

1. Learn functions transforming images between RGB, Indexed and Gray.

2. Master the method to smooth or sharpen an image.

3. Learn the ways to divide a color image.

## 2. Experiment Content:

Learn and mater the following functions: rgb2ind, rgb2gray, gray2ind, ind2gray, ind2rgb, colormap, dither, cat, colorseg.

## 3. Experiment Steps:

### 1. Use functions for transforming images among RGB, Indexed and Gray.

Use function rgb2ind and specidies the number of colors in colormap to 8, matlab produces indexed image and display it with imshow(image,colormap).

Dithered image

No dithered image

There are some subtle differences in two pics, the dithered image looks more real cause dither can create more colors for human eyes than ordinary indexed picture.

Next step, turn the color image into gray image with function rgb2gray, then use dither to show the effect of it.

Gray image

Dithered image

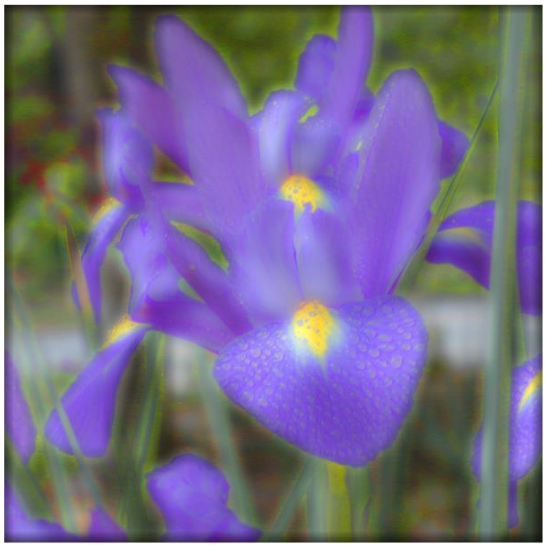
We can be told that dither algorithm present different intensity with specified density of black dots.

## 2. Smoothing and Sharpening color images.

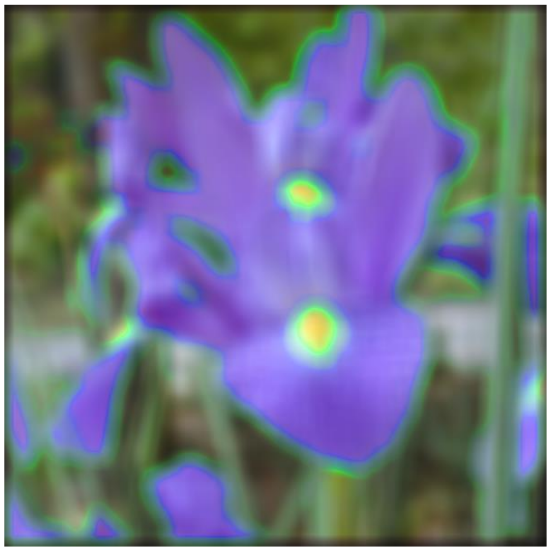
With function imfilter, the varying part, which is also recognised as details, are removed. But when we use a window to extract the edges and subtract them from the image, the pic is sharpened cause the edges are turned into black.

Smoothed Image

Sharpened Image



Only intensity



Three components

When only smooth intensity component, the edges of this pic became brighter, cause previously they are pretty dark and smoothing algorithm made a tradeoff, brightened dark region. If we filter three components, new color component will show up. Cause hue is changed.

## 3. Color image segmentation

First, select the region of interest, which is displayed below:

Then the matlab will generate a mtrix “mask”, representing the chosen area with logical value 1, the other region is set to zero. Extract corresponding pixels from the original pic with immultiply, those positions set to 0 in mask multiply original image setting those points to 0. Each HSI component is processed with this same method, at last concatenate them together. Function colorseg should operate in RGB color space, thus, a color space transformation is also required.

When the ROI selected, colorseg need its mean and standard deviation. Form the result, we can be told the

‘euclidean’ way is worse than ‘mahalanobis’ way.

Euclidean method

Mahalanobis method

## 4. Conclusions and Experiences:

RGB and HSI are two color spaces, each of them has ground usage, HSI can make contribution in computer vision, while RGB is widely in image processing and printing. The mahalanobis distance is more complicated but also has better processing result. Color image filtering could, im my opinion, can play a significant role in beauty camera with smoothing algorithm. Welks could be easily removed by match its color to surrounding area.

## 5. Appendix（Code）:

Mission1

```
clear all

clc

[y,mapy]=imread('G:\desktop documents\2018´óÈýÏÂ\Êý×ÖÍ¼Ïñ´¦Àí×ÊÁÏFor students\For students\³ÌÐòÓëÍ¼Ïñ\Í¼Ïñ¿â\Fig0630(01)(strawberries_fullcolor).tif');

[x1,map1]=rgb2ind(y,8,'dither');
```

```
[x2,map2]=rgb2ind(y,8,'nodither');

figure

imshow(x1,map1)

set(gca,'position',[0 0 1 1])

figure

imshow(x2,map2)

set(gca,'position',[0 0 1 1])



g1=rgb2gray(y);

figure

imshow(g1);

set(gca,'position',[0 0 1 1]);


di=dither(g1)

figure

imshow(di);

set(gca,'position',[0 0 1 1]);
```

Mission2

```
clear all

clc

[y,mapy]=imread('G:\desktop documents\2018´óÈýïÂ\Êý×Öí¼ïñ´¦Àí×ÊÁïFor students\For
```

```
students\³ìÐòÓëí¼ïñ\í¼ïñ¿â\Fig0604(a)(iris).tif');
%ydoub=im2double(y);
w=ones(25)./(25*25);
yf=imfilter(y,w);
figure
imshow(yf)
set(gca,'position',[0 0 1 1])

ws=[1 1 1 1 1;1 1 1 1 1;1 1 -24 1 1; 1 1 1 1 1; 1 1 1 1 1];
ysp=imsubtract(yf,imfilter(yf,ws,'replicate'));
figure
imshow(ysp)
set(gca,'position',[0 0 1 1])

hsiy=rgb2hsi(y);
H=hsiy(:,:,1);
S=hsiy(:,:,2);
I=hsiy(:,:,3);
I_filtered=imfilter(I,w);
H_filtered=imfilter(H,w);
S_filtered=imfilter(S,w);
im1=cat(3,H,S,I_filtered);
im2=cat(3,H_filtered,S_filtered,I_filtered);
```

```
rgbim1=hsi2rgb(im1);

rgbim2=hsi2rgb(im2);

figure

imshow(rgbim1)

set(gca,'position',[0 0 1 1])


figure

imshow(rgbim2)

set(gca,'position',[0 0 1 1])
```

Mission3

```
clc

clear all

[y,mapy]=imread('G:\desktop documents\2018´óÈýÏÂ\Êý×ÖÍ¼Ïñ´¦Àí×ÊÁÏFor students\For

students\³ÌÐòÓëÍ¼Ïñ\Í¼Ïñ¿â\Fig0636(woman_baby_original).tif');

hsiy=rgb2hsi(y);

mask=roipoly(y);

H=immultiply(mask,hsiy(:,:,1));

S=immultiply(mask,hsiy(:,:,2));

I=immultiply(mask,hsiy(:,:,3));

g=cat(3,H,S,I);

grgb=hsi2rgb(g);

figure
```

```
imshow(grgb)
set(gca,'position',[0 0 1 1])

[M,N,k]=size(grgb);
I=reshape(grgb,M*N,3);
idx=find(mask);
I=double(I(idx,1:3));
[C,m]=covmatrix(I);
sd=sqrt(diag(C))
ydb=im2double(y);
E007=colorseg('euclidean',ydb,0.06,m);
figure
imshow(E007)
set(gca,'position',[0 0 1 1])

EM007=colorseg('mahalanobis',ydb,20,m,C);
figure
imshow(EM007)
set(gca,'position',[0 0 1 1])
```