

第二題：影像色彩轉換

```
close all;
clc,clear;

% Abnormal color
%Make by 12/7 ,HW.2.
im=imread('ballon.jpg');
rgb=imresize(im,[500,500]); %scaledown
RGB=double(rgb); % double type
% RGB=reshape(ad,500*500,3); %change to 2D
%First transfer RGB to XYZ
%extract RGB Channel
R=RGB(:, :, 1)/255;
G=RGB(:, :, 2)/255;
B=RGB(:, :, 3)/255;

%Linearlization
r=R.^2.2;
g=G.^2.2;
b=B.^2.2;

XYZw=[0.95,1.0,1.09]; %input white
[M, N] = size(R);% get width and high
s = M * N; %image dimension
RGBe = [reshape(r,1,s); reshape(g,1,s); reshape(b,1,s)]; %scale
500x500
%
% % RGB to XYZ
MAT = [0.412453 0.357580 0.180423;
        0.212671 0.715160 0.072169;
        0.019334 0.119193 0.950227];
XYZ = MAT * RGBe; %Color conversion

% Normalize for D65 white point
X = XYZ(1, :) ;
Y = XYZ(2, :);
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Z = XYZ(3,:);
x=reshape(X,500,500);
y=reshape(Y,500,500);
z=reshape(Z,500,500);
xyznew=cat(3,x,y,z);

Lab = xyz2lab_simple(xyznew, XYZw);

l=Lab(:,:,1); % get l channel
a=Lab(:,:,2); % get a channel
b=Lab(:,:,3); % get b channel

% Color Conversion

Cab=sqrt(a.^2+b.^2); % Chroma formula
h = mod((180/pi)*atan2(b, a), 360); % Hue channel

F=zeros(500,500);% set to 0 matrix
anew=F+128;
bnew=b+128;
cnew=Cab*2;
hnew=(255/360)*h;
Lnew=2.55*l;
% transfer to int type
L8=uint8(Lnew);
h8=uint8(hnew);
a8=uint8(anew);
b8=uint8(bnew);
c8=uint8(cnew);

% show anyone gray_level images
figure(),imshow(L8);
figure(),imshow(a8);
figure(),imshow(b8);
figure(),imshow(h8);
figure(),imshow(c8);

newlab=cat(3,l,F,b); % combine 3 channel

```

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XYZn = lab2xyz_simple(newlab, XYZw); % use function
RGBnn = xyz2rgb(XYZn); % use function
%
% xx= XYZn(:,:,1);
% yy= XYZn(:,:,2);
% zz= XYZn(:,:,3);
% q=[reshape(xx,1,s); reshape(yy,1,s); reshape(zz,1,s)];
% RGBN = (MAT')\q ;
% rgbt = reshape(RGBN, 500, 500, 3); % reshape the Lab array to 3D
% mm=rgbt.^(1/2.2);

% rw=mm(:,:,1)*255;
% gw=mm(:,:,2)*255;
% bw=mm(:,:,3)*255;
%
% final=cat(3,rw,gw,bw);
ff=real(RGBnn);
fa=imresize(ff,[480,640]); %change to original size
fop=uint8(fa); % transfer to int type
figure(),imshow(fop);
imwrite(fop,'abnormal.jpg','jpg'); %store int image

```

➤ 自訂函式: XYZ2RGB (註:有參考別人資料進行修改)

```

function RGB = xyz2rgb(XYZ)

RGB = zeros(size(XYZ));
% this is the same matrix used in rgb2xyz.m

M = [
    0.4124  0.3576  0.1805;
    0.2126  0.7152  0.0722;
    0.0193  0.1192  0.9505];

invM = inv(M);

```

```

for i=1:3
    RGB(:,:,i) = XYZ(:,:,1)*invM(i,1) + XYZ(:,:,2)*invM(i,2) +
    XYZ(:,:,3)*invM(i,3);
end

index1 = find(RGB > 0.0031308);
index2 = find(RGB <= 0.0031308);

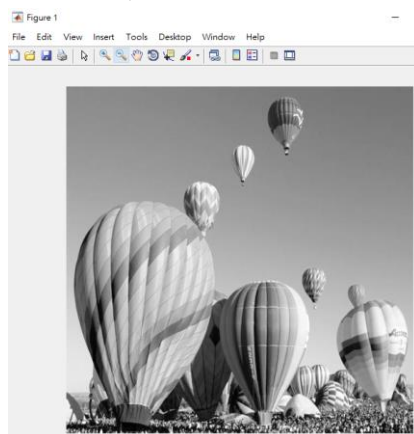
RGB(index1) = 1.055 * ( RGB(index1).^(1/2.4) ) - 0.055;
RGB(index2) = 12.92 * RGB(index2);
%RGB = RGB*255)
% Linearization and Normalization

RGB = round( (RGB.^(1/2.2)) *255);

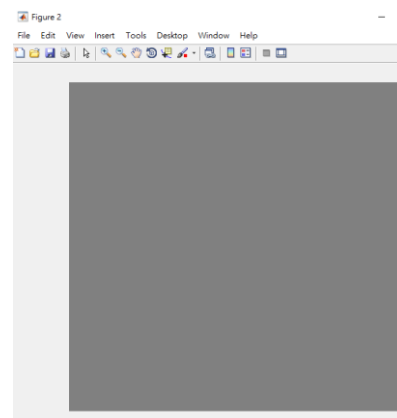
end

```

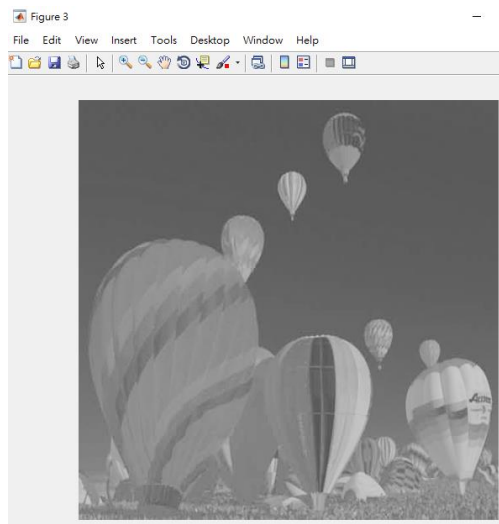
➤ 實驗結果 uint 影像



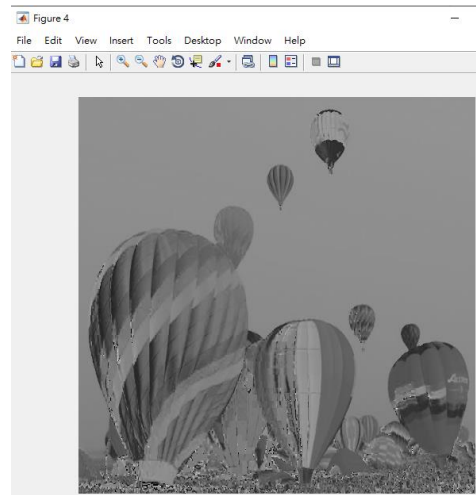
L 通道



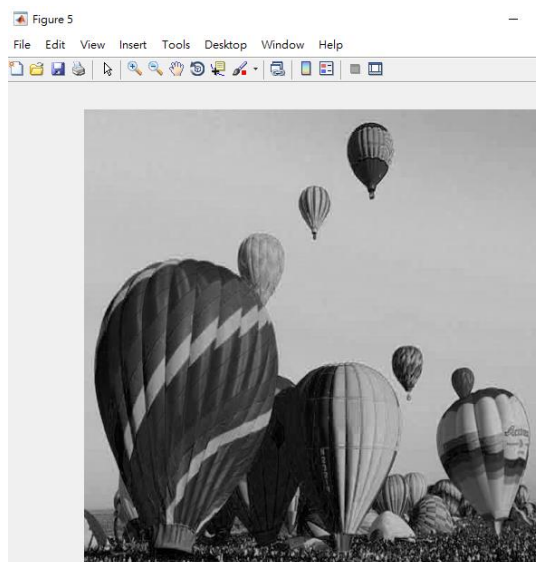
a 通道



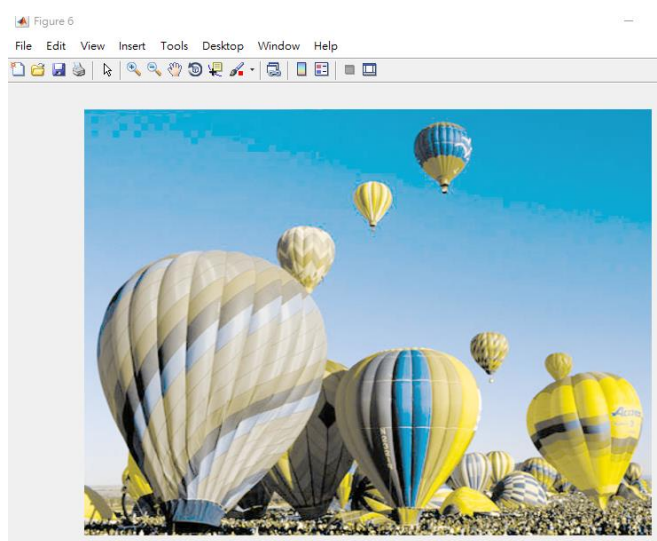
b 通道



色相 h



彩度 c



輸出色彩異常影像結果

➤ 色彩異常所見成像(亮度問題)