

Sample 2-5

画像データの入出力

色空間変換

画像処理特論

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動作確認: MATLAB R2023a

Input and output of images

Color space conversion

Advanced Topics in Image Processing

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Verified: MATLAB R2023a

サンプル画像の準備

(Preparation of sample image)

本サンプルで利用する画像データを収めた data フォルダにパスをとおす。

Create a path to the data folder that contains images used in this sample.

```
addpath('./data')
close
% Reading original image
X = im2double(imread('firenzeRgb.jpg'));
figure(1)
imshow(X)
title('Original')
```

Original



ネガ変換

(Negative conversion)

$$\begin{pmatrix} y_R \\ y_G \\ y_B \end{pmatrix} = T \begin{pmatrix} x_R \\ x_G \\ x_B \end{pmatrix} = \begin{pmatrix} 1.0 \\ 1.0 \\ 1.0 \end{pmatrix} - \begin{pmatrix} x_R \\ x_G \\ x_B \end{pmatrix}$$

```
% Definition of negative conversion
```

```
Tn = @(x) 1.0-x;
```

```
% Negative conversion of image I
```

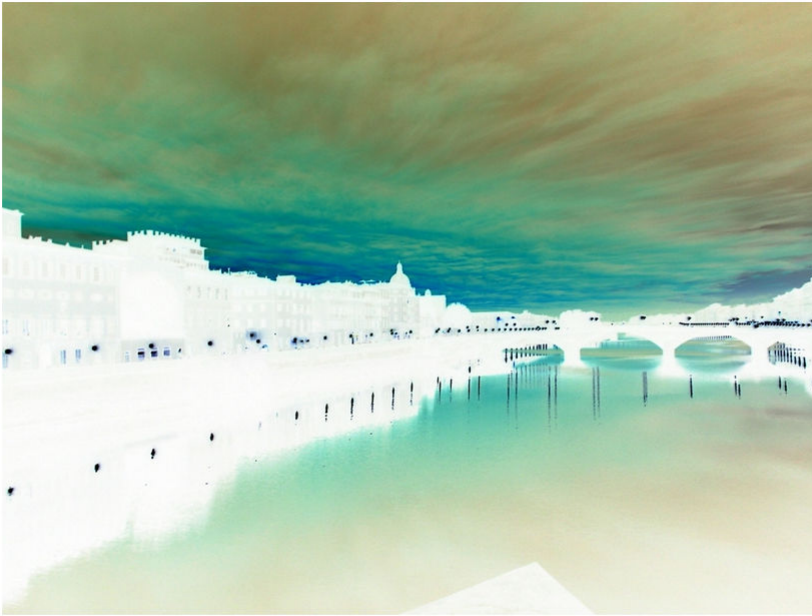
```
Y = Tn(X);
```

```
figure(2)
```

```
imshow(Y)
```

```
title('Negative')
```

Negative



RGB 空間でべき乗則変換

(Power law conversion in RGB space)

$$\begin{pmatrix} y_R \\ y_G \\ y_B \end{pmatrix} = T \begin{pmatrix} x_R \\ x_G \\ x_B \end{pmatrix} = \begin{pmatrix} x_R^\gamma \\ x_G^\gamma \\ x_B^\gamma \end{pmatrix}$$

```
% Parameter setting of power law conversion  
gamma = 0.5
```

```
gamma = 0.5000
```

```
% Power law conversion in RGB space  
Y = imadjust(X,[],[],gamma);  
figure(3)  
imshow(Y)  
title('Power law conversion in RGB space')
```

Power law conversion in RGB space



HSV 空間で V 成分のみべき乗則変換

(Power law conversion for V component in HSV space)

$$\begin{pmatrix} u_H \\ u_S \\ u_V \end{pmatrix} = \text{rgb2hsv} \begin{pmatrix} x_R \\ x_G \\ x_B \end{pmatrix}$$

$$\begin{pmatrix} y_R \\ y_G \\ y_B \end{pmatrix} = \text{hsv2rgb} \begin{pmatrix} u_H \\ u_S \\ u_V^\gamma \end{pmatrix}$$

```
% Parameter setting of power law conversion
```

```
gamma = 0.5
```

```
gamma = 0.5000
```

```
% Power law conversion for V component in HSV space
```

```
U = rgb2hsv(X);
```

```
[H,S,V] = imsplit(U);
```

```
V = imadjust(V,[],[],gamma);
```

```
U = cat(3,H,S,V);
```

```
Y = hsv2rgb(U);
```

```
figure(4)
```

```
imshow(Y)
```

```
title('Power law conversion for V component in HSV space')
```

Power law conversion for V component in HSV space



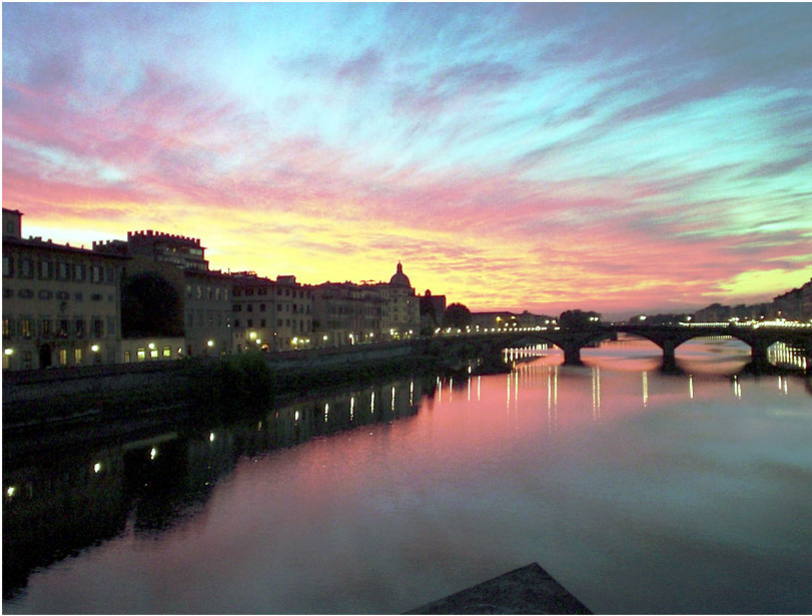
RGB 空間でヒストグラム均等化

(Histogram equalization in RGB space)

$$\begin{pmatrix} y_R \\ y_G \\ y_B \end{pmatrix} = T \begin{pmatrix} x_R \\ x_G \\ x_B \end{pmatrix} = \begin{pmatrix} \text{histeq}(x_R) \\ \text{histeq}(x_G) \\ \text{histeq}(x_B) \end{pmatrix}$$

```
% Histogram equalization in RGB space
[R,G,B] = imsplit(X);
R = histeq(R);
G = histeq(G);
B = histeq(B);
Y = cat(3,R,G,B);
figure(5)
imshow(Y)
title('Histogram equalization in RGB space')
```

Histogram equalization in RGB space



HSV 空間で V 成分のみヒストグラム均等化

(Histogram equalization for V component in HSV space)

$$\begin{pmatrix} u_H \\ u_S \\ u_V \end{pmatrix} = \text{rgb2hsv} \begin{pmatrix} x_R \\ x_G \\ x_B \end{pmatrix}$$
$$\begin{pmatrix} y_R \\ y_G \\ y_B \end{pmatrix} = \text{hsv2rgb} \begin{pmatrix} u_H \\ u_S \\ \text{histeq}(u_V) \end{pmatrix}$$

```
% Histogram equalization for V component in HSV space
U = rgb2hsv(X);
[H,S,V] = imsplit(U);
V = histeq(V);
U = cat(3,H,S,V);
Y = hsv2rgb(U);
figure(6)
imshow(Y)
title('Histogram equalization for V component in HSI space')
```


Histogram equalization for V component in HSI space



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