

Sample 2-3

画像データの入出力

輝度値変換

画像処理特論

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動作確認: MATLAB R2020a

Input and output of images

Intensity transforms

Advanced Topics in Image Processing

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Verified: MATLAB R2020a

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。

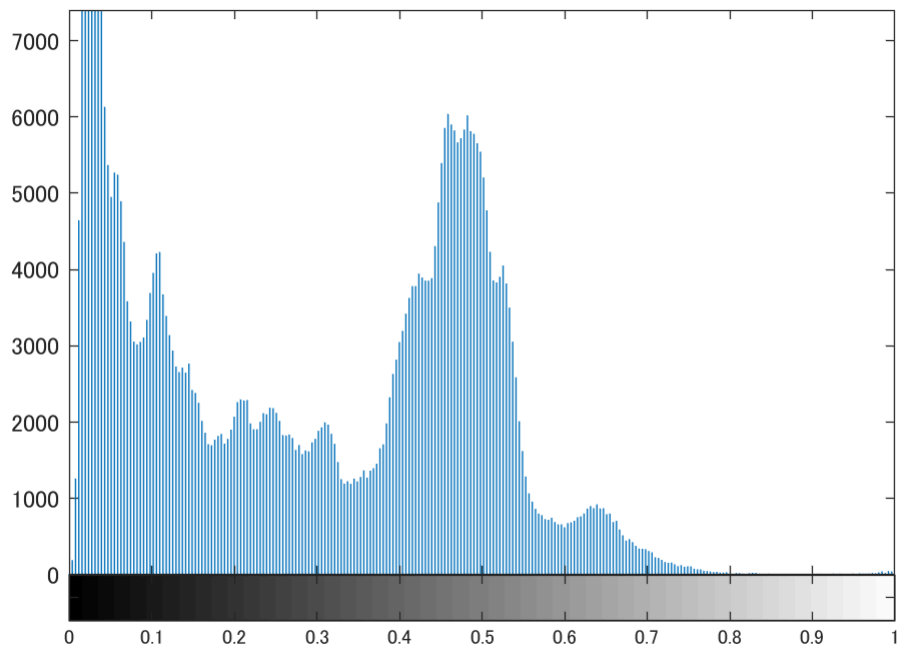
Create a path to the data folder that contains images used in this sample.

```
addpath('./data')
close
% Reading original image
I = im2double(rgb2gray(imread('firenzeRgb.jpg')));
figure(1)
imshow(I)
title('Original')
```

Original



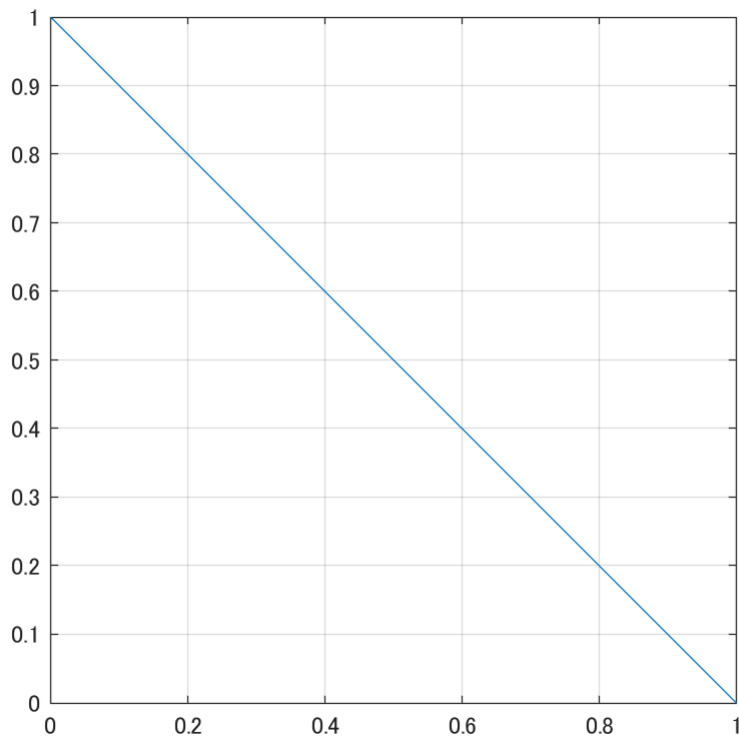
```
figure(2)  
imhist(I)
```



ネガ変換
(Negative conversion)

$$y = T(x) = 1.0 - x$$

```
% Definition of negative conversion  
Tn = @(x) 1.0-x;  
figure(3)  
fplot(Tn,[0,1])  
axis square  
grid on
```

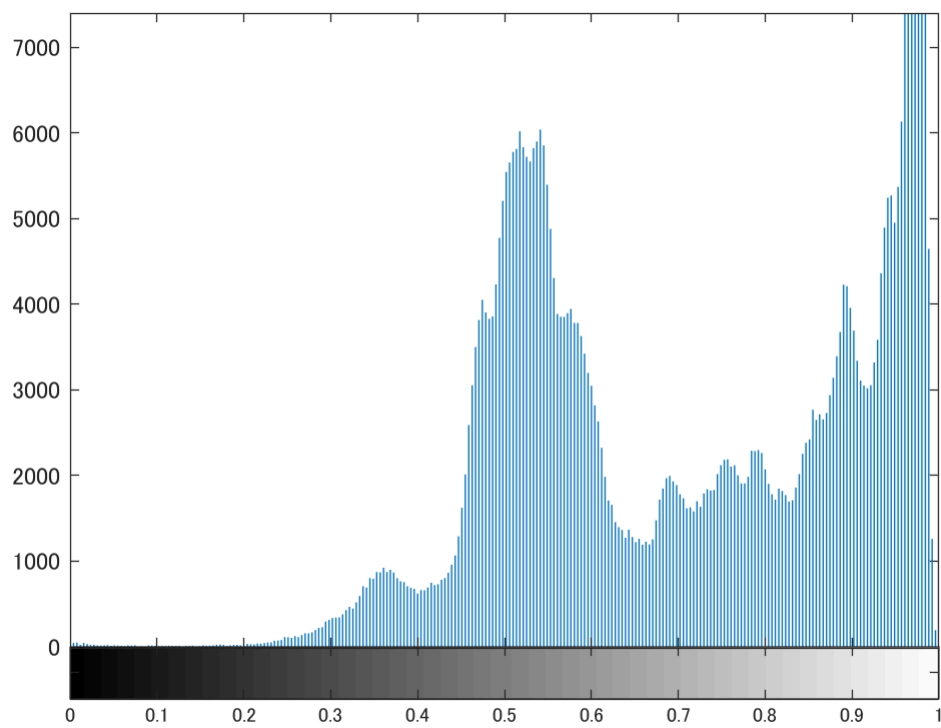


```
% Negative conversion of image I  
J = Tn(I);  
figure(4)  
imshow(J)  
title('Negative')
```

Negative



```
figure(5)  
imhist(J)
```



对比伸長

(Contrast stretching)

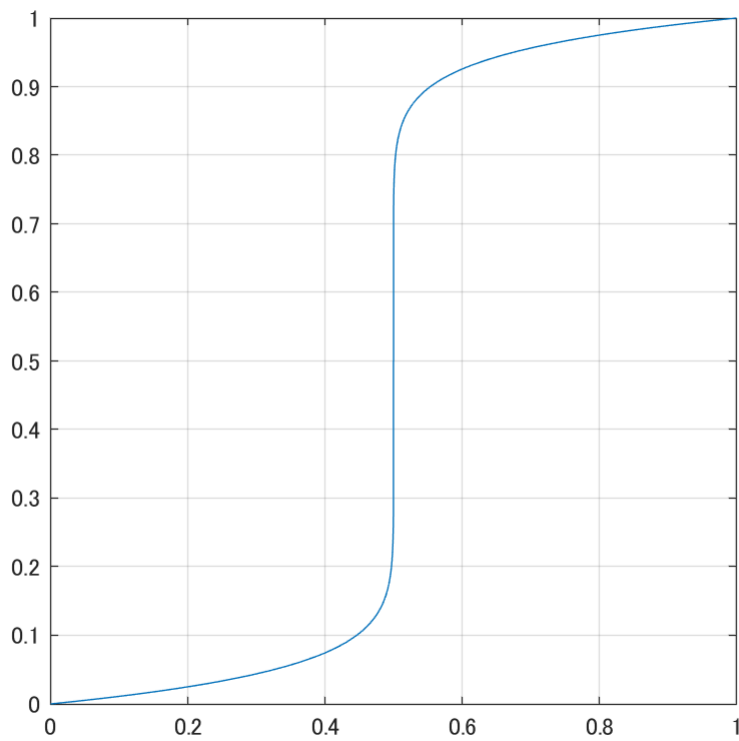
$$y = T(x) = \frac{1}{2}(\text{sign}(2x - 1)|2x - 1|^{10^{-\alpha}} + 1)$$

```
% Definition of contrast stretching
```

```
alpha = 1
```

```
alpha = 1
```

```
Tc = @(x) 0.5*(sign(2.0*x-1.0).*abs(2*x-1.0).^(10^(-alpha))+1.0);  
figure(6)  
fplot(Tc,[0,1])  
axis square  
grid on
```



```
% Contrast stretching of image I
```

```
K = Tc(I);
```

```
figure(7)
```

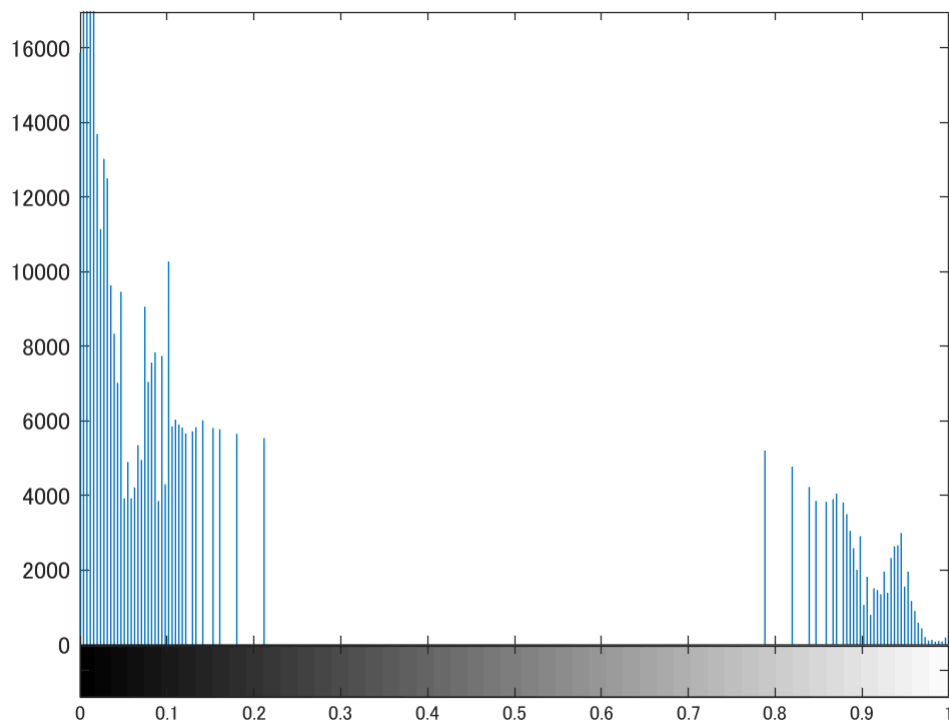
```
imshow(K)
```

```
title('Contrast stretching')
```

Contrast stretching



```
figure(8)
imhist(K)
```



べき乗則変換

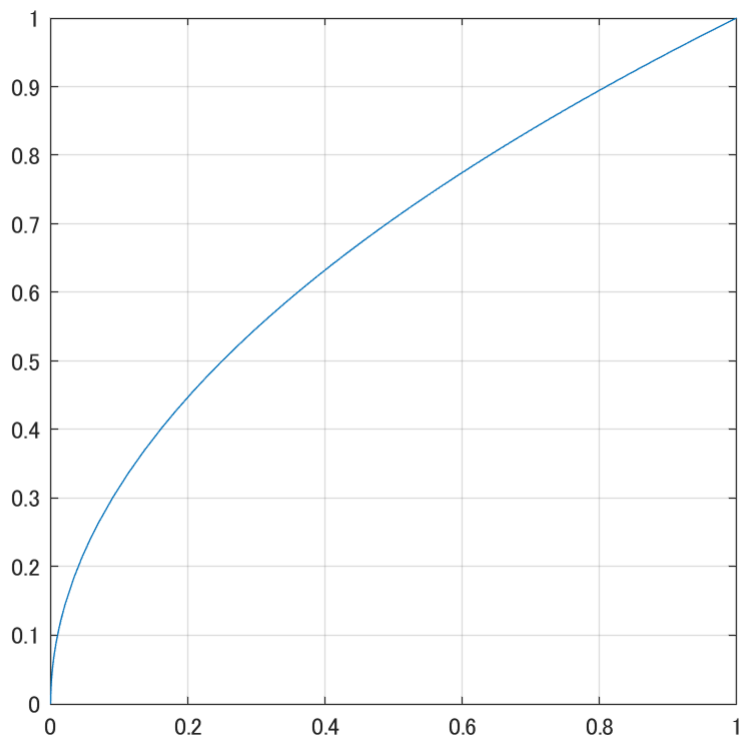
(Power law conversion)

$$y = T(x) = x^\gamma$$

```
% Definition of power law conversion  
gamma = 0.5
```

```
gamma = 0.5000
```

```
Tp = @(x) x.^gamma;  
figure(9)  
fplot(Tp,[0,1])  
axis square  
grid on
```

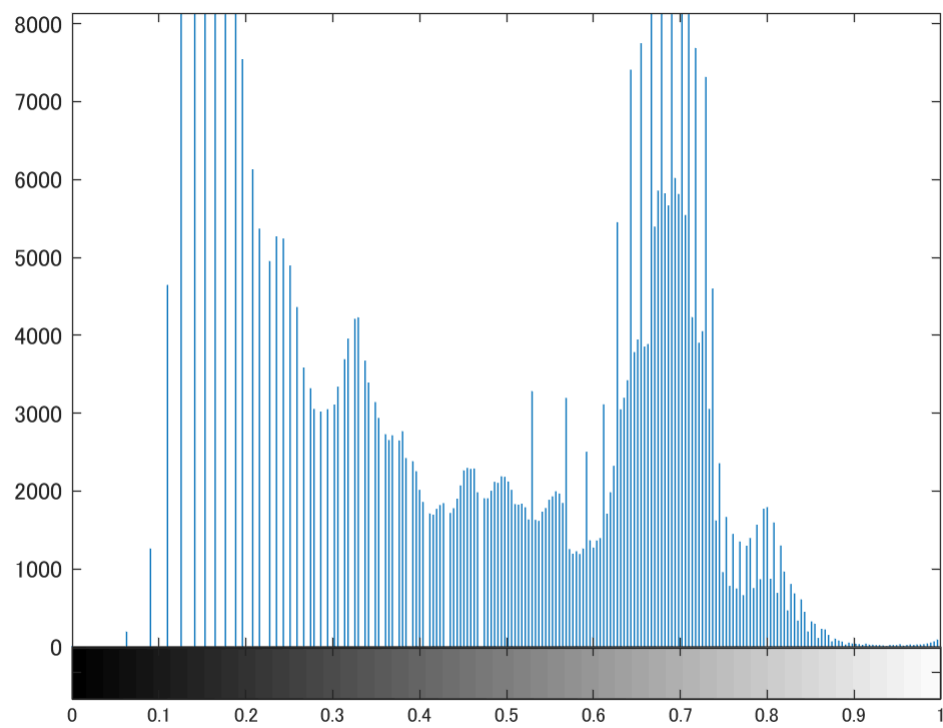


```
% Power law conversion of image I  
L = Tp(I);  
figure(10)  
imshow(L)  
title('Power law conversion')
```

Power law conversion



```
figure(11)  
imhist(L)
```



輝度値調整関数

(Image adjustment function)

IMADJUST は高機能な輝度値調整関数で、uint8型画像に対してもべき乗則変換を含めた細かい調整が可能

IMADJUST is a sophisticated intensity adjustment function that allows fine tuning of images including uint8-type ones, such as power law conversion.

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

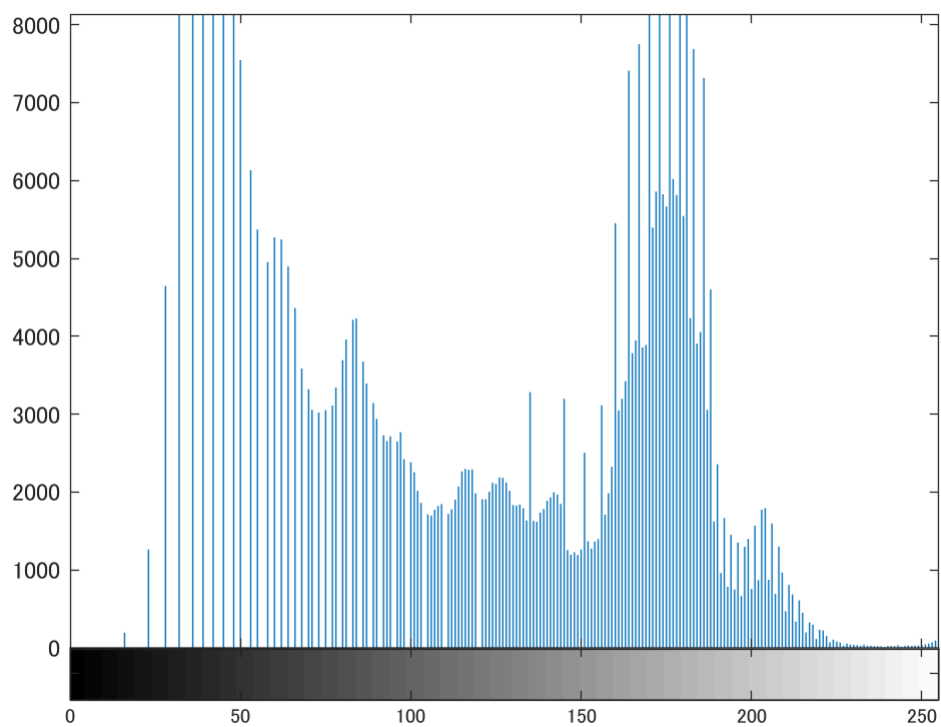
```
gamma = 0.5000
```

```
% Conversion to uint8  
U = im2uint8(I);  
% Power law conversion with IMADJUST function  
M = imadjust(U,[],[],gamma);  
figure(12)  
imshow(M)  
title('Power law conversion with IMADJUST')
```

Power law conversion with IMADJUST



```
figure(13)  
imhist(M)
```



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