Sample 3-5

平滑化／先鋭化処理

境界処理

画像処理特論

村松 正吾

動作確認: MATLAB R2020a

Image smoothing/sharpening

Boundary operation

Advanced Topics in Image Processing

Shogo MURAMATSU

Verified: MATLAB R2020a

配列のパディング

(Pad array)

- Zero padding
- Periodic extension
- Symmetric extension

```
% Pad size setting
padsize = 2;
%
A = randi(8,4)
```

```
A = 4×4
     6     1     6     3
     6     4     4     1
     8     1     6     3
     2     6     2     2
```

```
% Zero padding
B = padarray(A,[padsize padsize],0,'both')
```

```
B = 8×8
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
     0     0     6     1     6     3     0     0
     0     0     6     4     4     1     0     0
     0     0     8     1     6     3     0     0
     0     0     2     6     2     2     0     0
     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0
```

```
% Periodic extension
C = padarray(A,[padsize padsize],'circular','both')
```

```
C = 8×8
     6     3     8     1     6     3     8     1
     2     2     2     6     2     2     2     6
     6     3     6     1     6     3     6     1
     4     1     6     4     4     1     6     4
     6     3     8     1     6     3     8     1
     2     2     2     6     2     2     2     6
     6     3     6     1     6     3     6     1
     4     1     6     4     4     1     6     4
```

```
% Symmetric extension
D = padarray(A,[padsize padsize],'symmetric','both')
```

```
D = 8×8
     4     6     6     4     4     1     1     4
     1     6     6     1     6     3     3     6
     1     6     6     1     6     3     3     6
     4     6     6     4     4     1     1     4
     1     8     8     1     6     3     3     6
     6     2     2     6     2     2     2     2
     6     2     2     6     2     2     2     2
     1     8     8     1     6     3     3     6
```

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(imread('barbaraFaceRgb.tif'));
figure(1)
imshow(I)
title('Original')
```

フィルタの設定

(Filter setting)

```
% Filter setting
hsize = 3;
f = fspecial('average',hsize);
```

零値拡張

(Zero padding)

```
% Zero padding
Jz = imfilter(I,f);

% Show result
figure(2)
imshow(Jz)
title('After filtering (zero padding)')
```

周期拡張

(Periodic extension)

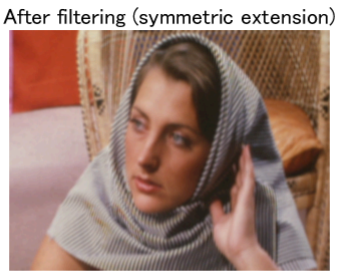
```
% Periodic extension
Jp = imfilter(I,f,'circular');

% Show result
figure(3)
imshow(Jp)
title('After filtering (periodic extension)')
```

対称拡張
(Symmetric extension)

```
% Symmetric extension
Js = imfilter(I,f,'symmetric');

% Show result
figure(4)
imshow(Js)
title('After filtering (symmetric extension)')
```



結果の比較
(Comparison)

```
% Patch size
psize = 64;

% Zero padding
figure(5)
subplot(1,3,1)
imshow(Jz(end-psize+1:end,1:psize,:))
title('Zero padding')

% Periodic extension
subplot(1,3,2)
imshow(Jp(end-psize+1:end,1:psize,:))
title('Periodic extension')

% Zero padding
subplot(1,3,3)
imshow(Js(end-psize+1:end,1:psize,:))
title('Symmetric extension')
```

Zero padding

Periodic extension

Symmetric extension