

## Sample 3-5

### 平滑化／先鋭化処理

境界処理

画像処理特論

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動作確認: MATLAB R2023a

### Image smoothing/sharpening

Boundary operation

Advanced Topics in Image Processing

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Verified: MATLAB R2023a

### 配列のパディング

(Pad array)

- Zero padding
- Periodic extension
- Symmetric extension

```
% Pad size setting
```

```
padsiz = 2;
```

```
%
```

```
A = randi(8,4)
```

```
A = 4×4
```

4	1	6	8
6	2	4	3
7	8	3	1
4	3	3	1

```
% Zero padding
```

```
B = padarray(A,[padsiz padsiz],0,'both')
```

```
B = 8×8
```

0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	4	1	6	8	0	0
0	0	6	2	4	3	0	0
0	0	7	8	3	1	0	0
0	0	4	3	3	1	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

```
% Periodic extension
```

```
C = padarray(A,[padsz padsz],'circular','both')
```

```
C = 8x8
    3     1     7     8     3     1     7     8
    3     1     4     3     3     1     4     3
    6     8     4     1     6     8     4     1
    4     3     6     2     4     3     6     2
    3     1     7     8     3     1     7     8
    3     1     4     3     3     1     4     3
    6     8     4     1     6     8     4     1
    4     3     6     2     4     3     6     2
```

```
% Symmetric extension
```

```
D = padarray(A,[padsz padsz],'symmetric','both')
```

```
D = 8x8
    2     6     6     2     4     3     3     4
    1     4     4     1     6     8     8     6
    1     4     4     1     6     8     8     6
    2     6     6     2     4     3     3     4
    8     7     7     8     3     1     1     3
    3     4     4     3     3     1     1     3
    3     4     4     3     3     1     1     3
    8     7     7     8     3     1     1     3
```

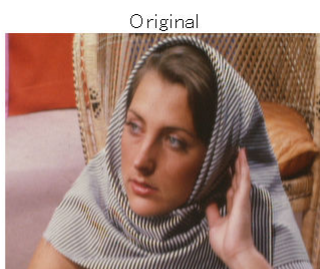
## サンプル画像の準備

(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)')
```

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)')
```

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)')
```

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')

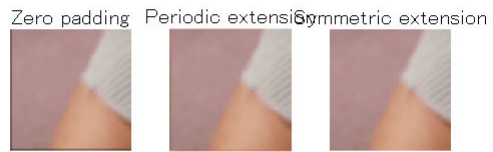
% Periodic extension
subplot(1,3,2)
```

```

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')

```



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