

1 章 演習

```
clear;
X = [15 31 71 45 55 62 18 88 50 60];
mprintf("平均点  %4.2f  標準偏差  %4.2f  最高点  %d  最低点  %d", ..
    mean(X),..
    stdev(X),..
    max(X),..
    min(X));
```

```
clear;
X = [175 77;
    168 60;
    180 68;
    160 55;
    165 80];
mprintf("平均身長  %5.2f  平均体重  %4.2f", mean(X(:,1)), mean(X(:,2)));
// mprintf(" 平均身長  %5.2f  平均体重  %4.2f", mean(X, 'r'));
plot2d(X(:,1), X(:,2), -4, rect=[0,0,200,100])
```

実践演習 2-1

(ア) size(P,'c')

(イ) :,i

実践演習 2-2

```
[mindist, ans] = min(sqrt(sum((P-repmat(x,[1,size(P,'c')]))).^2,'r'))
```

実践演習 2-3

```
clear;
P = [[0,1,1,1,0,..
    1,0,0,0,1,..
    1,0,0,0,1,..
    1,0,0,0,1,..
    0,1,1,1,0]',..
    [0,0,1,0,0,..
    0,0,1,0,0,..
    0,0,1,0,0,..
    0,0,1,0,0,..
    0,0,1,0,0]',..
    [0,1,1,1,1,..
    1,0,0,1,0,..
    0,0,1,0,0,..
    0,1,0,0,0,..
    1,1,1,1,1]',..
    [0,1,1,1,0,..
    1,0,0,0,1,..
    0,0,1,1,0,..
    1,0,0,0,1,..
    0,1,1,1,0]',..
    [0,0,1,0,0,..
    0,1,0,0,0,..
    1,0,0,1,0,..
    1,1,1,1,1,..
    0,0,0,1,0]']];
```

```

x = [0,0,0,1,0,...
      0,0,0,1,0,...
      0,0,0,1,0,...
      0,0,0,1,0,...
      0,0,0,1,0]';

function feature = feature_extraction(data)
    feature = [];
    for i = 1:size(data, 'c')
        img = matrix(data(:,i), 5, 5)';
        feature = [feature, [detect_line(img), detect_line(img')]]';
    end
endfunction

function val = detect_line(m)
    val = 0;
    for i = 1:size(m, 'c')
        if regexp(strcat(string(m(:,i))), '/111/') > 0
            val = val + 1;
        end
    end
endfunction

F = feature_extraction(P);
x2 = feature_extraction(x);

[mindist, ans] = min(sqrt(sum((F-repmat(x2,[1,size(F,'c')]))).^2,'r')));
disp("Ans = "+string(ans-1))

```

実践演習 3-1

(ア) y, x

(イ) y-1:y+1, x-1:x+1

実践演習 3-2

```

clear;

// 画像データの読み込み
im = im2double(imread('test1.pgm'));
// 2次元配列 im のサイズ取得
[h w] = size(im);
// 結果格納用の配列 resultim を用意
resultim1 = ones(im);
resultim2 = ones(im);

// フィルタ適用
for y = 2:h-1
    for x = 2:w-1
        resultim1(y, x) = median(im(y-1:y+1, x-1:x+1));
        resultim2(y, x) = mean(im(y-1:y+1, x-1:x+1));
    end
end

// 結果の表示とファイルへの出力
imshow([im, resultim1, resultim2])
imwrite([im, resultim1, resultim2], 'out.png');

```

実践演習 3-3

```
clear;

// 画像データの読み込み
im = im2double(imread('test1.pgm'));
// 2次元配列 im のサイズ取得
[h w] = size(im);
// 結果格納用の配列 resultim を用意
resultim = ones(im);
// Sobelフィルタの定義
dx=[-1,0,1; -2,0,2; -1,0,1];
dy=[1,2,1; 0,0,0; -1,-2,-1];

// フィルタ適用
for y = 2:h-1
    for x = 2:w-1
        resultim(y, x) = sqrt(sum(im(y-1:y+1, x-1:x+1) .* dx)^2+...
            sum(im(y-1:y+1, x-1:x+1) .* dy)^2);
    end
end

// 結果の表示とファイルへの出力
imshow([im, resultim])
imwrite([im, resultim], 'out.png');
```

実践演習 4-1

- (ア) size
- (イ) mean
- (ウ) stdev
- (エ) m
- (オ) s
- (カ) pca

実践演習 4-2

```
clear;
M = csvRead('iris.csv');
X = M(:,1:4);
[n d] = size(X);

// 標準化
m = mean(X, 'r');
s = stdev(X, 'r');
normX = (X - repmat(m, [n,1])) ./ repmat(s, [n,1]);

// 主成分分析
[l, f, c] = pca(normX);
plot2d(c(1:50,1), c(1:50,2), style=-3, rect=[-4,-4,4,4])
plot2d(c(51:100,1), c(51:100,2), style=-4)
plot2d(c(101:150,1), c(101:150,2), style=-5)
```
