COMPUTER VISION 1

Homework 4

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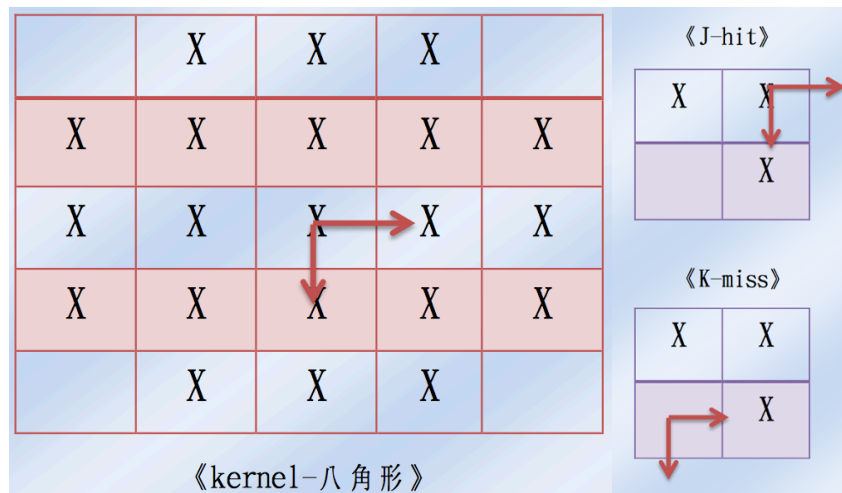學號　　：　R05942060

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Computer Vision Report – Homework 4

R05942060 蘇宛琳

Question : Write programs which do binary morphological

dilation, erosion, opening, closing, and hit-and-miss transform on a binary image

dilation, erosion, opening, closing   => 35553 kernal

hit-and-miss transform => J-hit kernel, k-miss kernal

Write a program to do binary morphological dilation, erosion, opening, closing, and hit-and-miss transform
on a binary image

lena.bmp   binarizelena.bmp

```matlab
clear;
close;
```

Binaries LENA image

```matlab
%Binarize LENA image
LENA = imread('lena.bmp');
INFO = imfinfo('lena.bmp');
for x = 1:INFO.Height,
    for y = 1:INFO.Width,
        T = 128;
        if LENA(x,y) > T;
            LENA(x,y) = 255;
        else
            LENA(x,y) = 0;
        end;
    end;
end;
imwrite(LENA,'binarizelena.bmp');
```

Kernel (35553 matrix)

```matlab
%Kernel(35553 matrix)
kerx = zeros(21,1);
kery = zeros(21,1);
kerx(1) = -2; kery(1) = -1;  %(-2,-1)
kerx(2) = -2; kery(2) =  0;  %(-2, 0)
kerx(3) = -2; kery(3) =  1;  %(-2, 1)
kerx(4) = -1; kery(4) = -2;  %(-1,-2)
kerx(5) = -1; kery(5) = -1;  %(-1,-1)
kerx(6) = -1; kery(6) =  0;  %(-1, 0)
kerx(7) = -1; kery(7) =  1;  %(-1, 1)
kerx(8) = -1; kery(8) =  2;  %(-1, 2)
kerx(9) =  0; kery(9) = -2;  %( 0,-2)
kerx(10)=  0; kery(10) = -1; %( 0,-1)
```

```
kerx(11)=  0; kery(11)=  0;  %( 0, 0)

kerx(12)=  0; kery(12)=  1;  %( 0, 1)

kerx(13)=  0; kery(13)=  2;  %( 0, 2)

kerx(14)=  1; kery(14)= -2;  %( 1,-2)

kerx(15)=  1; kery(15)= -1;  %( 1,-1)

kerx(16)=  1; kery(16)=  0;  %( 1, 0)

kerx(17)=  1; kery(17)=  1;  %( 1, 1)

kerx(18)=  1; kery(18)=  2;  %( 1, 2)

kerx(19)=  2; kery(19)= -1;  %( 2,-1)

kerx(20)=  2; kery(20)=  0;  %( 2, 0)

kerx(21)=  2; kery(21)=  1;  %( 2, 1)
```

Kernel (J_hit)

```
%J_hit
kerjx(1) = 0; kerjy(1) = 0;  %( 0, 0)

kerjx(2) = 0; kerjy(2) =-1;  %( 0,-1)

kerjx(3) = 1; kerjy(3) = 0;  %( 1, 0)
```

Kernel (k_miss)

```
%k_miss
kerkx(1) =-1; kerky(1) = 0;  %(-1, 0)

kerkx(2) =-1; kerky(2) = 1;  %(-1, 1)

kerkx(3) = 0; kerky(3) = 1;  %( 0, 1)
```

Call function

```
%Dilation
ImageDilation(LENA,kerx,kery,21,1);

%Erosion
ImageErosion(LENA,kerx,kery,21,1);

%Opening
ImageOpening(LENA,kerx,kery,21,1);

%Closing
ImageClosing(LENA,kerx,kery,21,1);

%Hit_Miss
ImageHitMiss(LENA,kerjx,kerjy,kerkx,kerky,3,3,1);
```

ImageDilation function

```matlab
function output = ImageDilation(input,kerx,kery,n,showImage)


[Image_width,Image_height] = size(input);


for i = 1:Image_height,
   for j = 1:Image_width,
      if input(i,j) == 255,
         for k = 1:n;
            px= i + kerx(k);
            py= j + kery(k);
            if px>=1 && py>=1 && px <= Image_width && py <=
               Image_height;
               output(px,py) = 255;
            end;
          end;
       end;
    end;
end;
if ~exist('showImage') showImage=0;
end
if showImage~=0;
imwrite(output,'dilationLENA.bmp')
end
```


binarizelena.bmp　　　　　　　　　dilationlena.bmp

ImageErosion function

```matlab
function output1 = ImageErosion(input1,kerx,kery,n,showImage)


[Image_width,Image_height] = size(input1);


for i = 1:Image_height,
    for j = 1:Image_width,
        contain = 1;
        if contain == 1
            for k=1:n,
                px= i + kerx(k);
                py= j + kery(k);
                if px < 1 || py < 1 || px > Image_width ||
                    py>Image_height || input1(px,py)==0,
                    contain = 0;
                end;
            end;
        end;
        if contain == 1,
            output1(i,j) = 255;
        else
            output1(i,j) = 0;
        end;
    end;
end;
if ~exist('showImage') showImage=0;
end
if showImage~=0;
imwrite(output1,'erosionLENA.bmp')
end
```

binarizelena.bmp

erosionlena.bmp

ImageOpening function

```
function output2 = ImageOpening(input2,kerx,kery,n,showImage)


%Erosion
temp2 = ImageErosion(input2,kerx,kery,n);
%Dilation
output2 = ImageDilation(temp2,kerx,kery,n);


if ~exist('showImage') showImage=0;
end
if showImage~=0;
imwrite(output2,'openingLENA.bmp')
end
```


binarizelena.bmp

openinglena.bmp

ImageClosing function

```
function output3 = ImageClosing(input3,kerx,kery,n,showImage)

%Dilation
temp3 = ImageDilation(input3,kerx,kery,n);
%Erosion
output3 = ImageErosion(temp3,kerx,kery,n);

if ~exist('showImage') showImage=0;
end
if showImage~=0;
imwrite(output3,'closingLENA.bmp')
end
```


binarizelena.bmp   closinglena.bmp

ImageHitMiss function

```
function output4 =
ImageHitMiss(input4,kerjx,kerjy,kerkx,kerky,m,n,showImage)
[Image_width,Image_height] = size(input4);

for i = 1:Image_height,
    for j = 1:Image_width,
        comp(i,j) = 255 - input4(i,j);
    end;
end;
```

```matlab
% Erosion J-hit
image_hit=ImageErosion(input4,kerjx,kerjy,m);
% Erosion K-miss
image_miss=ImageErosion(comp,kerkx,kerky,n);
for i = 1:Image_height,
    for j = 1:Image_width,
        if image_hit(i,j)~=0 && image_miss(i,j)~=0
            output4(i,j) = 255;
        end;
    end;
end;
if ~exist('showImage') showImage=0;
end
if showImage~=0;
imwrite(output4,'hitmissLENA.bmp')
end
```
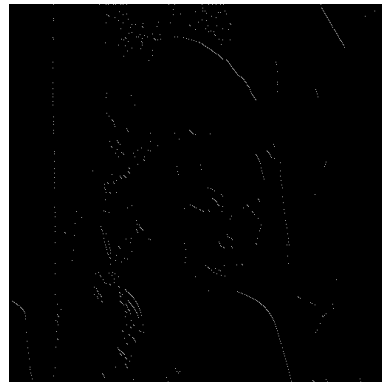

binarizelena.bmp   hitmisslena.bmp