

Read me_Kaiyun Xue

Problem 1:

The problem 1 files are in the `/Homework2/Problem1`. There are 2 `.m` files: `Problem1.m` and `getDispaMap.m`.

`Problem1.m` is the main code.

First it reads the image:

```
im_l=imread('teddyL.pgm');  
im_r=imread('teddyR.pgm');  
[aa,bb] = size(im_l);  
rankTranImageL=ones(aa,bb);  
rankTranImageR=ones(aa,bb);
```



Then we get the rank-transform images:

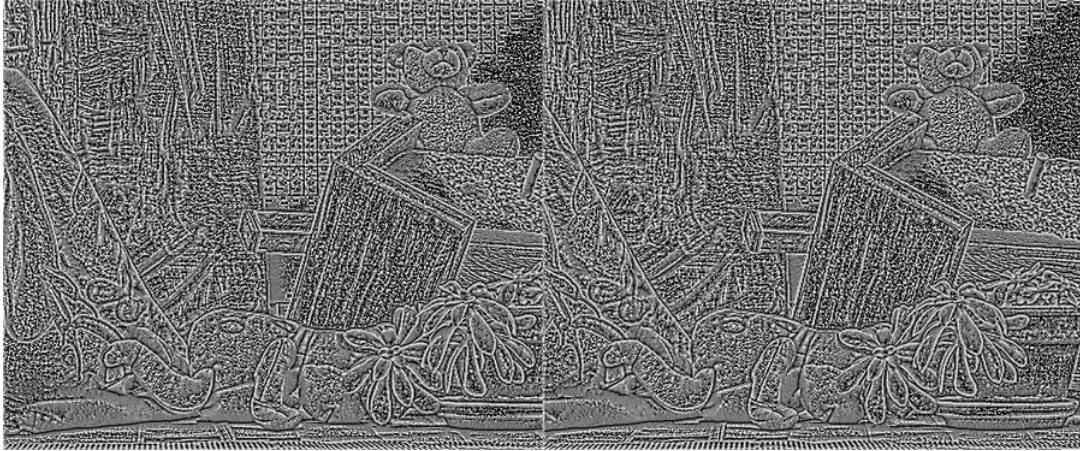
```
for i=1:aa  
    for j=1:bb  
        wndw_l=zeros(5,5);  
        wndw_r=zeros(5,5);  
        for k=i-2:i+2  
            for l=j-2:j+2  
                if k>0 && k<=aa && l>0 && l<=bb  
                    wndw_l(k-i+3,l-j+3)=im_l(k,l);  
                    wndw_r(k-i+3,l-j+3)=im_r(k,l);  
                end  
            end  
        end  
        rV_l=0;  
        rV_r=0;  
        for ii=1:5  
            for jj =1:5  
                if wndw_l(ii,jj)<wndw_l(3,3)  
                    rV_l = rV_l + 1;  
                end  
                if wndw_r(ii,jj)<wndw_r(3,3)  
                    rV_r = rV_r + 1;  
                end  
            end  
        end  
    end  
end
```

```

        end
    end
    rankTranImagel(i,j)=rV_l;
    rankTranImager(i,j)=rV_r;
end
end

imshow(uint8(rankTranImagel/25*256))
imshow(uint8(rankTranImager/25*256))

```



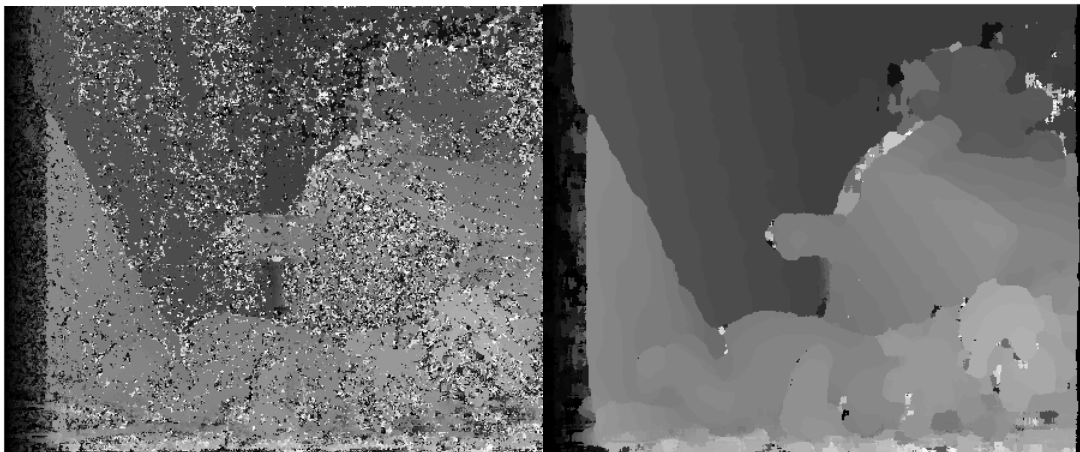
(both 2 images have been processed)

Then we calculate the disparity of these 2 images:

```

dispaMap3 = getDispaMap(rankTranImagel,rankTranImager,3);
dispaMap15 = getDispaMap(rankTranImagel,rankTranImager,15);

```



Where the getDispaMap is a function file which I will talk about it later.

Finally calculate the error rate:

```

dispaMapGT=imread('disp2.pgm');
dispaMapGT=dispaMapGT/4;
dispaMapGT=double(dispaMapGT);
load dispaMap3.mat;
diffDispaMap3=abs(dispaMapGT-dispaMap3);
errorNum3=length(find(diffDispaMap3>1));
errorRates3=errorNum3/numel(dispaMap3)

```

```

load dispaMap15.mat;
diffDispaMap15=abs (dispaMapGT-dispaMap15);
errorNum15=length (find (diffDispaMap15>1));
errorRates15=errorNum15/numel (dispaMap15)

```

The result:

```
errorRates3 =
```

```
0.4699
```

```
errorRates15 =
```

```
0.2228
```

getDispaMap.m is a function file. It needs to be input the left and right images and window's length of side. And it outputs the disparity map. imputit creates new windows and calculates the SAD and get the minimum SAD.

```

function [disMap] = getDispaMap(rankTranImagel,rankTranImager,n)
[aa,bb] = size(rankTranImagel);
disMap=ones(aa,bb);
for i=1:aa
    for j=1:bb
        winl=zeros(n,n);
        for k=i-(n-1)/2:i+(n-1)/2
            for l=j-(n-1)/2:j+(n-1)/2
                if k>0 && k<=aa && l>0 && l<=bb
                    winl(k-i+(n+1)/2,l-j+(n+1)/2)=rankTranImagel(k,l);
                end
            end
        end
        SAD=zeros(1,64);
        for d=0:63
            winr=ones(n,n);
            for k=1:n
                for l=1:n
                    if k+i-(n+1)/2<=0 || k+i-(n+1)/2>aa || l+j-
+ (n+1)/2<=0
                        winr(k,l)=0;
                    elseif l+j-(n+1)/2-d>0 && l+j-(n+1)/2-d<=bb
+ (n+1)/2-d);
                        winr(k,l)=rankTranImager(k+i-(n+1)/2,l+j-
                        else
                            winr(k,l)=0;
                        end
                    end
                end
            end
            SAD(d+1)=sum(sum(abs(winl-winr)));
        end
        [sadmin,ind]=min(SAD);
        disMap(i,j)=ind-1;
    end
end

```

end

Problem 2:

Problem 2's files are in the */Homework2/Problem2*. It's quite similar to problem1.

Code:

```
clear;
im_l=imread('teddyL.pgm');
im_r=imread('teddyR.pgm');
[aa,bb] = size(im_l);
rankTranImagel=ones(aa,bb);
rankTranImager=ones(aa,bb);
for i=1:aa
    for j=1:bb
        wndw_l=zeros(5,5);
        wndw_r=zeros(5,5);
        for k=i-2:i+2
            for l=j-2:j+2
                if k>0 && k<=aa && l>0 && l<=bb
                    wndw_l(k-i+3,l-j+3)=im_l(k,l);
                    wndw_r(k-i+3,l-j+3)=im_r(k,l);
                end
            end
        end
        rV_l=0;
        rV_r=0;
        for ii=1:5
            for jj =1:5
                if wndw_l(ii,jj)<wndw_l(3,3)
                    rV_l = rV_l + 1;
                end
                if wndw_r(ii,jj)<wndw_r(3,3)
                    rV_r = rV_r + 1;
                end
            end
        end
        rankTranImagel(i,j)=rV_l;
        rankTranImager(i,j)=rV_r;
    end
end

dispaMap3=ones(size(rankTranImagel,1),size(rankTranImagel,2));
conPKRN=ones(size(rankTranImagel,1),size(rankTranImagel,2));
for i=1:size(rankTranImagel,1)
    for j=1:size(rankTranImagel,2)
        winl=ones(3,3);
        for k=i-1:i+1
            for l=j-1:j+1
                if k<=0 || k>size(rankTranImagel,1) || l<=0 ||
l>size(rankTranImagel,2)
                    winl(k-i+2,l-j+2)=0;
                    continue;
                end
                winl(k-i+2,l-j+2)=rankTranImagel(k,l);
            end
        end
        sad=zeros(1,64);
        for d=0:63
```

```

winr=ones(3,3);
for k=1:3
    for l=1:3
        if k+i-2<=0 || k+i-2>size(rankTranImagel,1) || l+j-2<=0
            winr(k,l)=0;
        elseif l+j-2-d>0 && l+j-2-d<=size(rankTranImager,2)
            winr(k,l)=rankTranImager(k+i-2,l+j-2-d);
        else
            winr(k,l)=0;
        end
    end
end
sad(d+1)=sum(sum(abs(winl-winr)));
end
[sadmin,ind]=min(sad);
[sad_s,ind_s]=sort(sad);
dispaMap3(i,j)=ind-1;
conPKRN(i,j)=sad(ind_s(2))/sad(ind);
end
end
[con_s,ind_c]=sort(conPKRN(:),'descend');
num=size(dispaMap3,1)*size(dispaMap3,2);
for i=1:num
    if find(ind_c==i)>0.5*num
        dispaMap3(i)=0;
    end
end
dispaMap3int=uint8(dispaMap3);
dispaMap3int=dispaMap3int*4;

dispaMapGT=imread('disp2.pgm');
dispaMapGT=dispaMapGT/4;
dispaMapGT=double(dispaMapGT);
error_num=0;
for i=1:0.5*num
    if abs(dispaMapGT(ind_c(i))-dispaMap3(ind_c(i)))>1
        error_num=error_num+1;
    end
end
errorRates3=error_num/(0.5*num)

```

Result:

errorRates3 =

0.2897

