西安交通大学

计算机视觉与模式识别

计算机53班

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一、 填充 “add the code here”部分缺失的内容，调试通程序

carv.m填充部分

```
% remove the horizontal seams
for i = 2 : nr + 1
    %generate the energy map
    e = genEngMap(TI{i - 1,1});

    %dynamic programming matrix
    [My,Tby] = cumMinEngHor(e);
    [TI{i, 1}, E,~] = rmHorSeam(TI{i-1, 1}, My, Tby);

    %accumulate the energy
    T(i,1) = T(i - 1,1) + E;
end

% remove the vertical seams
for i = 2 : nc+1
    e = genEngMap(TI{1, i-1});
    [Mx,Tbx] = cumMinEngVer(e);
    [TI{1, i}, E,~] = rmVerSeam(TI{1, i-1}, Mx, Tbx);
    T(1, i) = T(1, i-1) + E;
end

% do the dynamic programming
for i = 2 : nr+1
    for j = 2 : nc+1
        e = genEngMap(TI{i-1, j});
        [My, Tby] = cumMinEngHor(e);
        [Iy, Ey,~] = rmHorSeam(TI{i-1, j}, My, Tby);

        e = genEngMap(TI{i, j-1});
        [Mx, Tbx] = cumMinEngVer(e);
        [Ix, Ex,~] = rmVerSeam(TI{i, j-1}, Mx, Tbx);
        if T(i, j-1) + Ex < T(i-1, j) + Ey
            TI{i, j} = Ix;
            T(i ,j) = T(i, j-1) + Ex;
            % inherite from row direction
        else
            TI{i, j} = Iy;
            T(i, j) = T(i-1, j) + Ey;
            % inherite from col direction
        end
        % suppress the memory for recording intermediate results
        TI{i-1,j} = [];
    end
end
```

cumMinEngHor.m填充部分

```
for i = 2 : nx
    for j = 1 : ny
        if j == 1
            [val,index] = min([My(j,i -1) My(j + 1,i - 1)]);
            My(j,i)= e(j,i) + val;
            index = index - 1;
            Tby(j,i) = index;
        elseif j == ny
            [val,index] = min([My(j - 1,i - 1) My(j,i -1)]);
            My(j,i)= e(j,i) + val;
            index = index - 2;
            Tby(j,i) = index;
        else
            [val,index] = min([My(j - 1,i - 1) My(j,i -1) My(j +
1,i - 1)]);
            My(j,i)= e(j,i) + val;
            index = index - 2;
            Tby(j,i) = index;
        end
    end
end
```

rmHorSeam.m填充部分

```
[val,index] = min(My(:,end));
E = val;
for i = nx :-1 :2
    Iy(1:index - 1,i,:) = I(1:index - 1,i,:);
    Iy(index:end,i,:) = I(index + 1:end,i,:);
    rmIdx(1,i) = index;
    if Tby(index,i) == -1
        index = index - 1;
    elseif Tby(index,i) == 1
        index = index + 1;
    end
end

Iy(1:index - 1,1,:) = I(1:index - 1,1,:);
Iy(index:end,1,:) = I(index + 1:end,1,:);
rmIdx(1,1) = index;
```

cumMinEngVer.m填充部分

```
for j = 2 : ny
    for i = 1 : nx
        if i == 1
            [val,index] = min([Mx(j - 1,i) Mx(j - 1,i + 1)]);
            Mx(j,i)= e(j,i) + val;
            index = index - 1;
            Tbx(j,i) = index;
        elseif i == nx
            [val,index] = min([Mx(j - 1,i - 1) Mx(j - 1,i)]);
            Mx(j,i)= e(j,i) + val;
            index = index - 2;
            Tbx(j,i) = index;
        else
            [val,index] = min([Mx(j - 1,i - 1) Mx(j - 1,i) Mx(j -
1,i + 1)]);
            Mx(j,i)= e(j,i) + val;
            index = index - 2;
            Tbx(j,i) = index;
        end
    end
end
```

rmVerSeam.m填充部分

```
%% Add your code here
[val,index] = min(Mx(end,:));
E = val;
for i = ny :-1 :2
    Ix(i,1:index - 1,:) = I(i,1:index - 1,:);
    Ix(i,index:end,:) = I(i,index + 1:end,:);
    rmIdx(i,1) = index;
    if Tbx(i,index) == -1
        index = index - 1;
    elseif Tbx(i,index) == 1
        index = index + 1;
    end
end

Ix(1,1:index - 1,:) = I(1,1:index - 1,:);
Ix(1,index:end,:) = I(1,index + 1:end,:);
rmIdx(1,1) = index;
```

carvAdd.m

```
%% my code
%add the horizontal seams
for i = 2 : nr + 1
    %generate the energy map
    e = genEngMap(TI{i - 1,1});

    %dynamic programming matrix
    [My,Tby] = cumMinEngHor(e);
    [TI{i, 1}, E] = addHorSeam(TI{i-1, 1}, My, Tby);

    %accumulate the energy
    T(i,1) = T(i - 1,1) + E;
end

%add the vertical seams
for i = 2 : nc+1
    e = genEngMap(TI{1, i-1});
    [Mx,Tbx] = cumMinEngVer(e);
    [TI{1, i}, E] = addVerSeam(TI{1, i-1}, Mx, Tbx);
    T(1, i) = T(1, i-1) + E;
end

for i = 2 : nr+1
    for j = 2 : nc+1
        e = genEngMap(TI{i-1, j});
        [My, Tby] = cumMinEngHor(e);
        [Iy, Ey] = addHorSeam(TI{i-1, j}, My, Tby);

        e = genEngMap(TI{i, j-1});
        [Mx, Tbx] = cumMinEngVer(e);
        [Ix, Ex] = addVerSeam(TI{i, j-1}, Mx, Tbx);
        if T(i, j-1) + Ex < T(i-1, j) + Ey
            TI{i, j} = Ix;
            T(i ,j) = T(i, j-1) + Ex;
            % inherite from row direction
        else
            TI{i, j} = Iy;
            T(i, j) = T(i-1, j) + Ey;
            % inherite from col direction
        end
        % suppress the memory for recording intermediate results
        TI{i-1,j} = [];
    end
end
```

addHorSeam.m

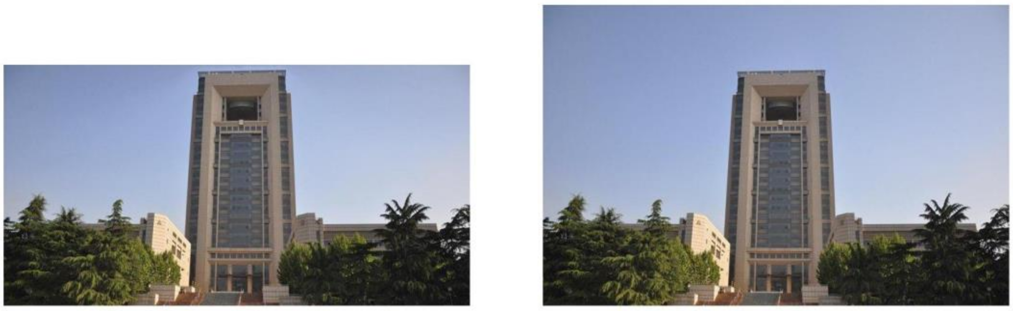
```
function [Iy, E] = addHorSeam(I, My, Tby)
% I is the image. Note that I could be color or grayscale image.
% My is the cumulative minimum energy map along horizontal direction.
% Tby is the backtrack table along horizontal direction.
% Iy is the image removed one row.
% E is the cost of seam removal
[ny, nx, nz] = size(I);
Iy = uint8(zeros(ny + 1,nx,nz));
[val,index] = min(My(:,end));
E = val;
for i = nx :-1 :2
    Iy(1:index,i,:) = I(1:index,i,:);
    Iy(index + 1,i,:) = I(index,i,:);
    Iy(index + 2:end,i,:) = I(index + 1:end,i,:);
    if Tby(index,i) == -1
        index = index - 1;
    elseif Tby(index,i) == 1
        index = index + 1;
    end
end

Iy(1:index,1,:) = I(1:index,1,:);
Iy(index + 1,1,:) = I(index,1,:);
Iy(index + 2:end,1,:) = I(index + 1:end,1,:);
End
```

addHorSeam.m

```
function [Ix, E] = addVerSeam(I, Mx, Tbx)
% I is the image. Note that I could be color or grayscale image.
% Mx is the cumulative minimum energy map along vertical direction.
% Tbx is the backtrack table along vertical direction.
% Ix is the image removed one column.
% E is the cost of seam removal
[ny, nx, nz] = size(I);
Ix = uint8(zeros(ny, nx + 1, nz));
[val,index] = min(Mx(end,:));
E = val;
for i = ny :-1 :2
    Ix(i,1:index,:) = I(i,1:index,:);
    Ix(i,index + 1,:) = I(i,index,:);
    Ix(i,index + 2:end,:) = I(i,index + 1:end,:);
    if Tbx(i,index) == -1
        index = index - 1;
    elseif Tbx(i,index) == 1
        index = index + 1;
    end
end

Ix(1,1:index,:) = I(1,1:index,:);
Ix(1,index + 1,:) = I(1,index,:);
Ix(1,index + 2:end,:) = I(1,index + 1:end,:);

end
```

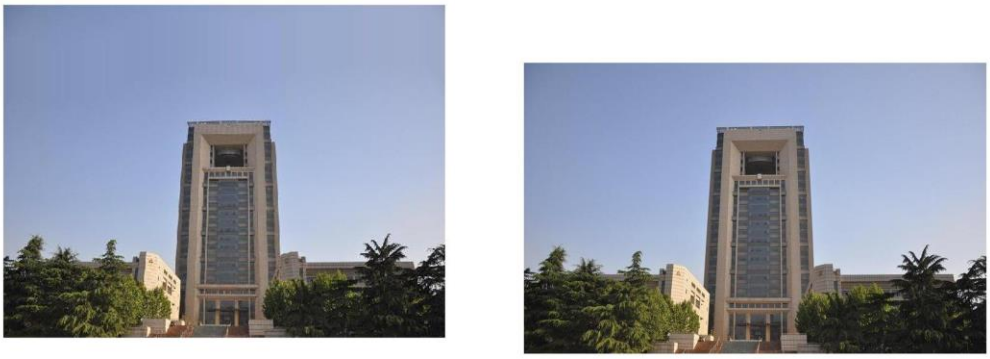
二、 找到自己拍摄的两幅照片，实现图像的缩放和图像的膨胀

图像的缩放



左边是缩放后的图片，右边是原图。

图像的膨胀



左边是膨胀后的图片，右边是原图。

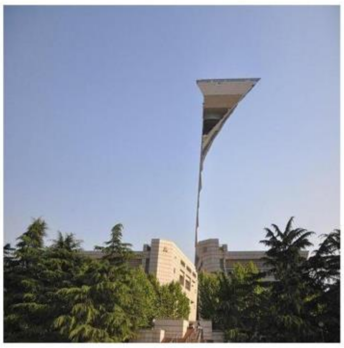
三、 找到自己拍摄的两幅照片，设置需要抹掉的照片部分，通过carving实现物体的擦除

Carv_with_mask源码

```
function [Ic, T] = carv_with_mask(I, nr, nc,mask,r_s)
```

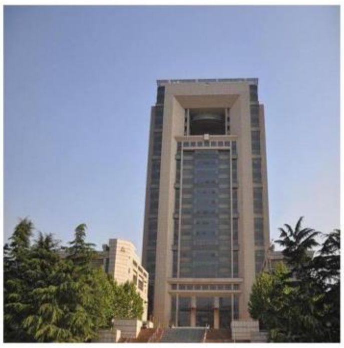
```
% I is the image being resized
% [nr, nc] is the numbers of rows and columns to remove.
% Ic is the resized image
% T is the transport map
% mask is where you want to remove or save
T = zeros(nr+1, nc+1);
TI = cell(nr+1, nc+1);
TI{1,1} = I;
Masks = cell(nr + 1,nc + 1);
Masks{1,1} = mask;

if ~exist('r_s','var')
    r_s = 1;
end

%% Add your code here
% remove the horizontal seams
for i = 2 : nr + 1
    %generate the energy map
    e = genEngMap(TI{i - 1,1});
    if r_s == 1
        e = e - e .* Masks{i - 1,1};
    elseif r_s == 0
        e = e - e .* Masks{i - 1,1} + 255 * Masks{i - 1,1};
    end
    %dynamic programming matrix
    [My,Tby] = cumMinEngHor(e);
    [TI{i, 1}, E,~,Masks{i,1}] = rmHorSeam_with_mask(TI{i-1, 1},
My, Tby,Masks{i - 1,1});

    %accumulate the energy
    T(i,1) = T(i - 1,1) + E;
end


% remove the vertical seams
for i = 2 : nc+1
    e = genEngMap(TI{1, i-1});
    if r_s == 1
        e = e - e .* Masks{1,i - 1};
    elseif r_s == 0
        e = e - e .* Masks{1,i - 1} + 255 * Masks{1,i - 1};
    end
    [Mx,Tbx] = cumMinEngVer(e);
    [TI{1, i}, E,~,Masks{1,i}] = rmVerSeam_with_mask(TI{1, i-1},
Mx, Tbx,Masks{1,i - 1});
    T(1, i) = T(1, i-1) + E;
end

% do the dynamic programming
for i = 2 : nr+1
    for j = 2 : nc+1
        e = genEngMap(TI{i-1, j});
        if r_s == 1
            e = e - e .* Masks{i - 1,j};
        elseif r_s == 0
            e = e - e .* Masks{i - 1,j} + 255 * Masks{i - 1,j};
        end
        [My, Tby] = cumMinEngHor(e);
        [Iy, Ey,~,mask_y] = rmHorSeam_with_mask(TI{i-1, j}, My,
Tby,Masks{i - 1,j});

        e = genEngMap(TI{i, j-1});
        if r_s == 1
            e = e - e .* Masks{i,j - 1};
        elseif r_s == 0
            e = e - e .* Masks{i,j - 1} + 255 * Masks{i,j - 1};
        end
        [Mx, Tbx] = cumMinEngVer(e);
        [Ix, Ex,~,mask_x] = rmVerSeam_with_mask(TI{i, j-1}, Mx,
Tbx,Masks{i,j - 1});
        if T(i, j-1) + Ex < T(i-1, j) + Ey
            TI{i, j} = Ix;
            T(i ,j) = T(i, j-1) + Ex;
            Masks{i,j} = mask_x;
            % inherite from row direction
        else
            TI{i, j} = Iy;
            T(i, j) = T(i-1, j) + Ey;
            Masks{i,j} = mask_y;
            % inherite from col direction
        end
        % suppress the memory for recording intermediate results
        TI{i-1,j} = [];
        Masks{i - 1,j} = [];
    end
end
```

```
Ic = TI{nr+1,nc+1};

end
```



左边是擦除的图像，右边是原图像。

四、 找到自己拍摄的两幅照片，设置需要保留的照片部分，通过carving实现物体的保留



左边是处理后的图片，右边是原图。