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、 填补 backward_geometry.m 程序中缺失的部分，让文件能够运行

源代码

```
function outputIm = backward_geometry(inputIm, A,type)
% inputIm = 输入的图像
%       A = 仿射变换的系数


%获取输入图像的大小
inputSize = size(inputIm);
if(size(inputIm, 3) == 1)
   inputSize(3) = 1;
end
%imshow(inputIm);
% 计算输出图像的画布大小;
[outputSize, deltaShift] = calcOutputSize(inputSize, A,type);
%A_inv = [(1/(A(1,1)*A(2,2)/A(1,2) - A(2,1))) 0;0
(1/(A(2,2)*A(1,1)/A(2,1) - A(1,2)))]* [(A(2,2)/A(1,2)) -1;-1
(A(1,1)/A(2,1))] * [1 0 -A(1,3);0 1 -A(2,3)];
A_inv = A(1:2,1:2);
B = A(:,3);
outputIm = zeros(outputSize(1),outputSize(2),3);


% 根据输出画布大大小来遍历
for i = 1 : outputSize(1)
    for j = 1 : outputSize(2)
        y = j + deltaShift(2);
        x = i + deltaShift(1);


        % 逆向变换
        z = A_inv \ ([x;y] - B);
        %z = round(z);
        z_floor = floor(z);
        delta = z - z_floor;
        w00 = (1 - delta(1)) * (1 - delta(2));
        w01 = delta(1) * (1 - delta(2));
        w10 = (1 - delta(1)) * delta(2);
        w11 = delta(1) * delta(2);
        % 双线性插值
```

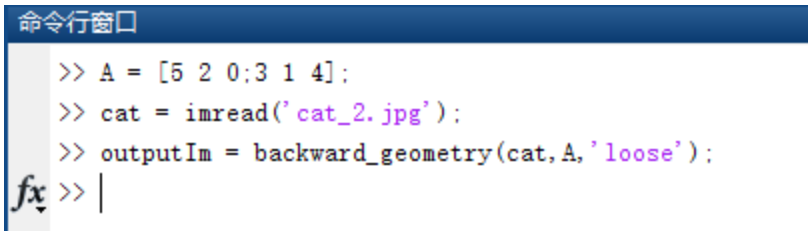
```
       if z_floor(1) >= 1 && z_floor(1) + 1 <= inputSize(2) &&
z_floor(2) >= 1 && z_floor(2) + 1 <= inputSize(1)
          outputIm(i,j,1) = w00 *
inputIm(z_floor(2),z_floor(1),1) + w01 * inputIm(z_floor(2) +
1,z_floor(1),1) + w10 * inputIm(z_floor(2),z_floor(1) + 1,1) +
w11 * inputIm(z_floor(2) + 1,z_floor(1) + 1,1);
          outputIm(i,j,2) = w00 *
inputIm(z_floor(2),z_floor(1),2) + w01 * inputIm(z_floor(2) +
1,z_floor(1),2) + w10 * inputIm(z_floor(2),z_floor(1) + 1,2) +
w11 * inputIm(z_floor(2) + 1,z_floor(1) + 1,2);
          outputIm(i,j,3) = w00 *
inputIm(z_floor(2),z_floor(1),3) + w01 * inputIm(z_floor(2) +
1,z_floor(1),3) + w10 * inputIm(z_floor(2),z_floor(1) + 1,3) +
w11 * inputIm(z_floor(2) + 1,z_floor(1) + 1,3);
          %outputIm(i,j,2) = inputIm(z(2),z(1),2);
          %outputIm(i,j,3) = inputIm(z(2),z(1),3);
       end
    end
end
outputIm = uint8(outputIm);
end
```

```
function [outputSize, deltaShift] = calcOutputSize(inputSize,
A,type)
% 'crop'
% Make output image B the same size as the input image A,
cropping the rotated image to fit
% {'loose'}
% Make output image B large enough to contain the entire
rotated image. B is larger than A


ny = inputSize(1);
nx = inputSize(2);

inputBoundingBox = [ 1  1 1;...
                     nx  1 1;...
                     nx ny 1;...
                      1 ny 1];
inputBoundingBox = inputBoundingBox';
```

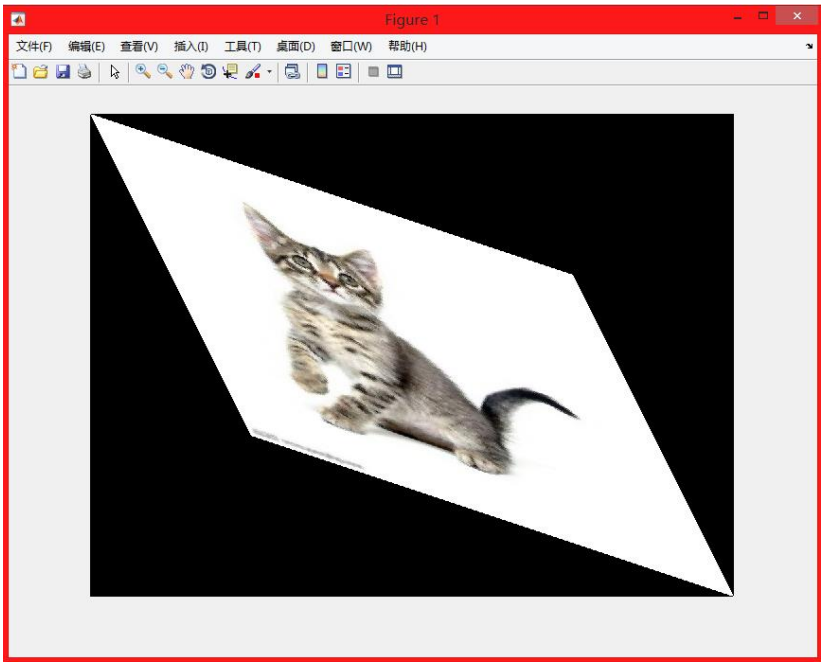
```
outputBoundingBox = A * inputBoundingBox;


xlo = floor(min(outputBoundingBox(1,:)));
xhi =  ceil(max(outputBoundingBox(1,:)));
ylo = floor(min(outputBoundingBox(2,:)));
yhi =  ceil(max(outputBoundingBox(2,:)));


if strcmpi(type,'loose')
    outputSize(1) = xhi - xlo;
    outputSize(2) = yhi - ylo;
else
    outputSize(1) = nx;
    outputSize(2) = ny;
end

if strcmpi(type,'loose')
    deltaShift(1) = xlo - 1;
    deltaShift(2) = ylo - 1;
else
    deltaShift(1) = 0;
    deltaShift(2) = 0;
end
end
```

实验结果

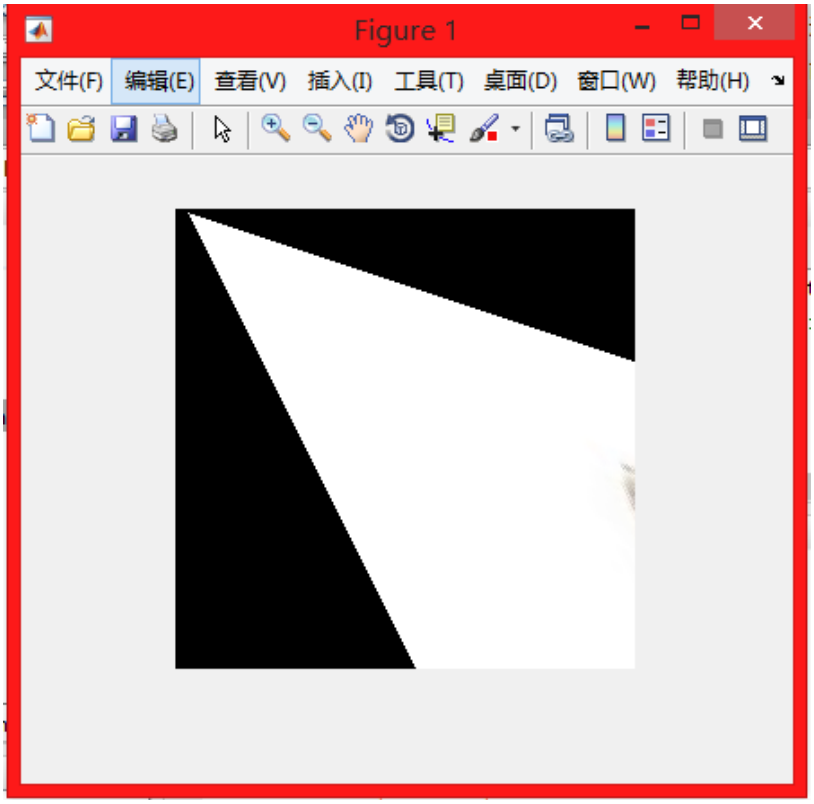
输入如下命令（使用 loose 模式）



输出结果如下



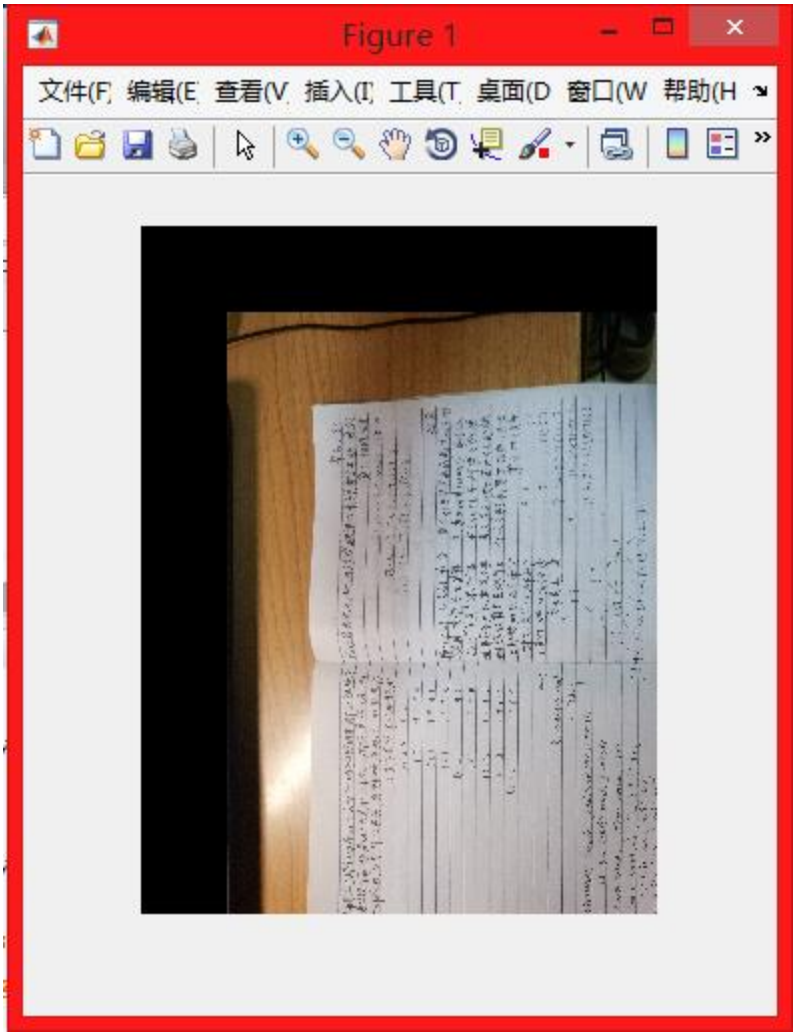
使用 crop 模式，结果如下



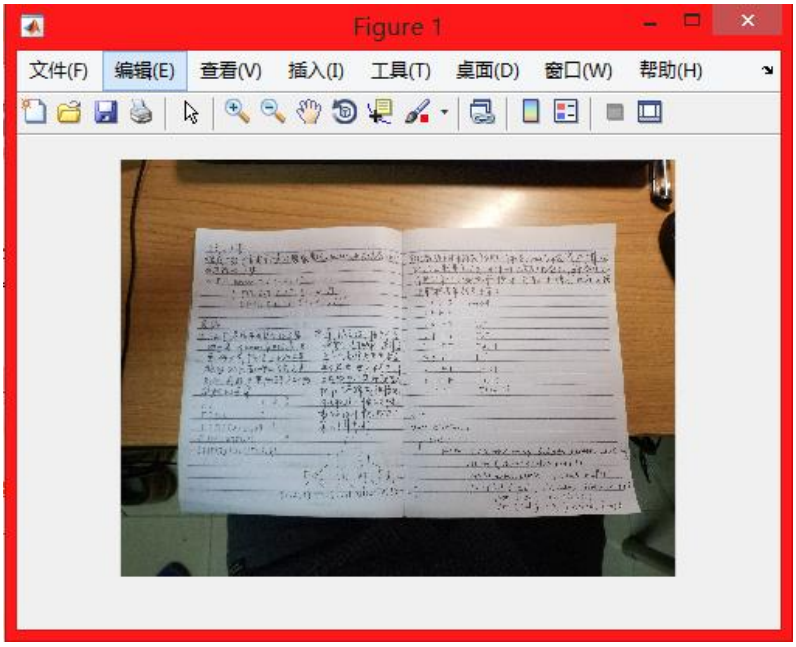
二、 自己选择 3 幅自己拍摄的照片，自己设计放射变换矩阵实现变换

平移变换，使用的系数矩阵 A=[1 0 8;0 1 8]，为了方便展示效果使

用 crop 模式，结果如下：



翻转变换，使用的系数矩阵 A=[0 1 0;1 0 0]，结果如下：



错切变换，使用的系数矩阵 A = [0.5 0.5 0;1.5 1 0]，结果如下：