Contents

Metric rectification from orthogonal lines

perform metric rectification of an image. Given at least 5 pairs of image of orthogonal lines, the script finds the image of the dual conic to circular points and computes the homography that brings it back to its canonical form

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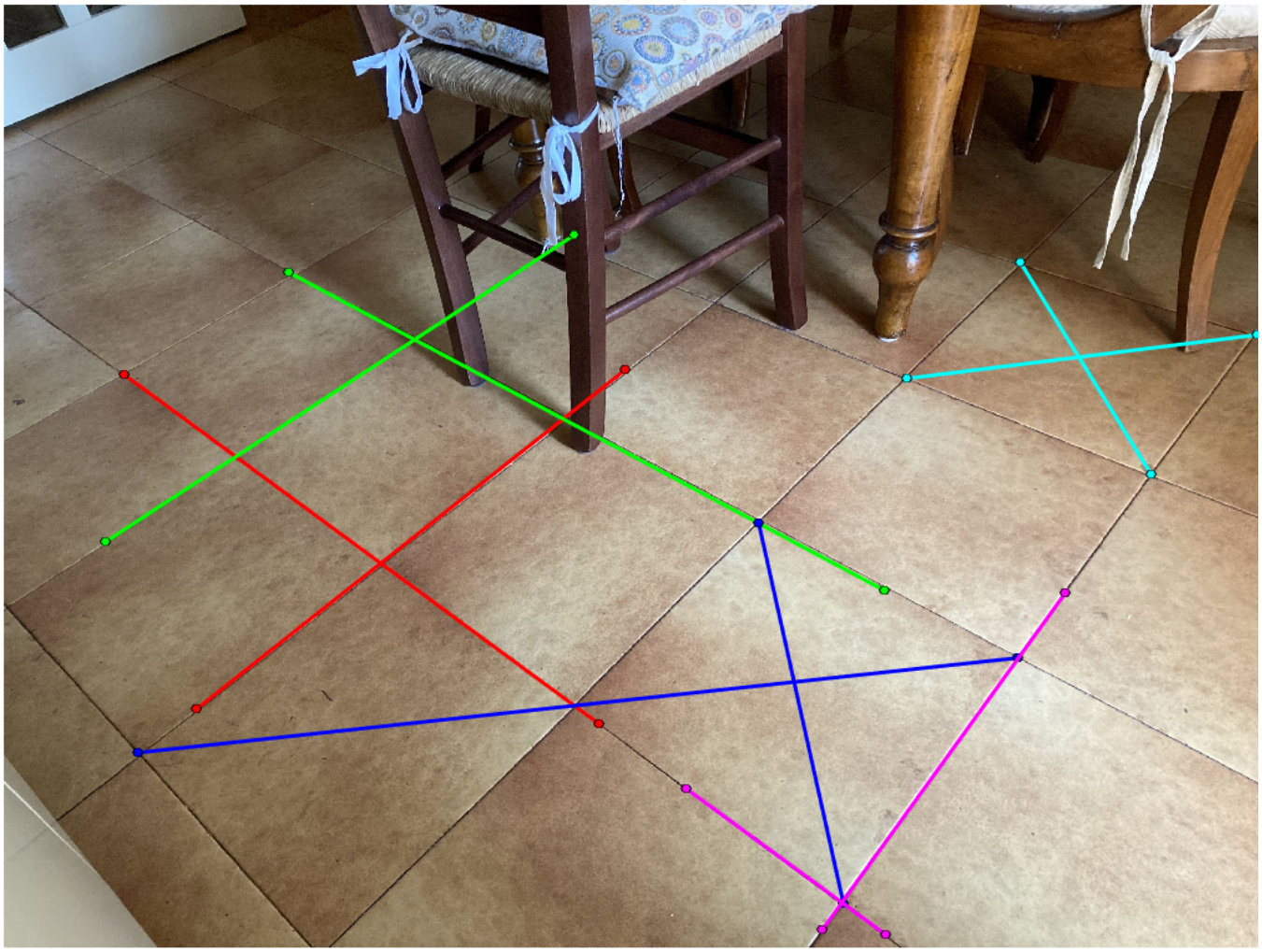
```
clear;
close all;
img = imread('E4_data/img1.JPG');
```

```
figure;
imshow(img);
numConstraints = 5; %>=5
hold all;
fprintf('Draw 5 pairs of orthogonal segments\n');
count = 1;
A = zeros(numConstraints,6);

% select pairs of orthogonal segments
while (count <=numConstraints)
    figure(gcf);
    title(['Draw ', num2str(numConstraints),' pairs of orthogonal segments: step ',num2str(count) ]);
    col = 'rgbcmykwrgbcmykw';
    segment1 = drawline('Color',col(count));
    segment2 = drawline('Color',col(count));

    l = segToLine(segment1.Position);
    m = segToLine(segment2.Position);

    % each pair of orthogonal lines gives rise to a constraint on the image
    % of the dual conic of principal points imDCCP
    % [l(1)*m(1),0.5*(l(1)*m(2)+l(2)*m(1)),l(2)*m(2),0.5*(l(1)*m(3)+l(3)*m(1))
    %  0.5*(l(2)*m(3)+l(3)*m(2)), l(3)*m(3)]*v = 0
    % store the constraints in a matrix A
    A(count,:) = [l(1)*m(1),0.5*(l(1)*m(2)+l(2)*m(1)),l(2)*m(2),...
        0.5*(l(1)*m(3)+l(3)*m(1)),  0.5*(l(2)*m(3)+l(3)*m(2)), l(3)*m(3)];
    count = count+1;
end
```

```
Draw 5 pairs of orthogonal segments
```

Draw 5 pairs of orthogonal segments: step 5



Compute the imDCCP image of the dual conic to circular points

```
[~,~,v] = svd(A); %
sol = v(:,end); %sol = (a,b,c,d,e,f)  [a,b/2,d/2; b/2,c,e/2; d/2 e/2 f];
imDCCP = [sol(1)  , sol(2)/2, sol(4)/2;...
    sol(2)/2, sol(3)  , sol(5)/2;...
    sol(4)/2, sol(5)/2  sol(6)];
```

compute the rectifying homography

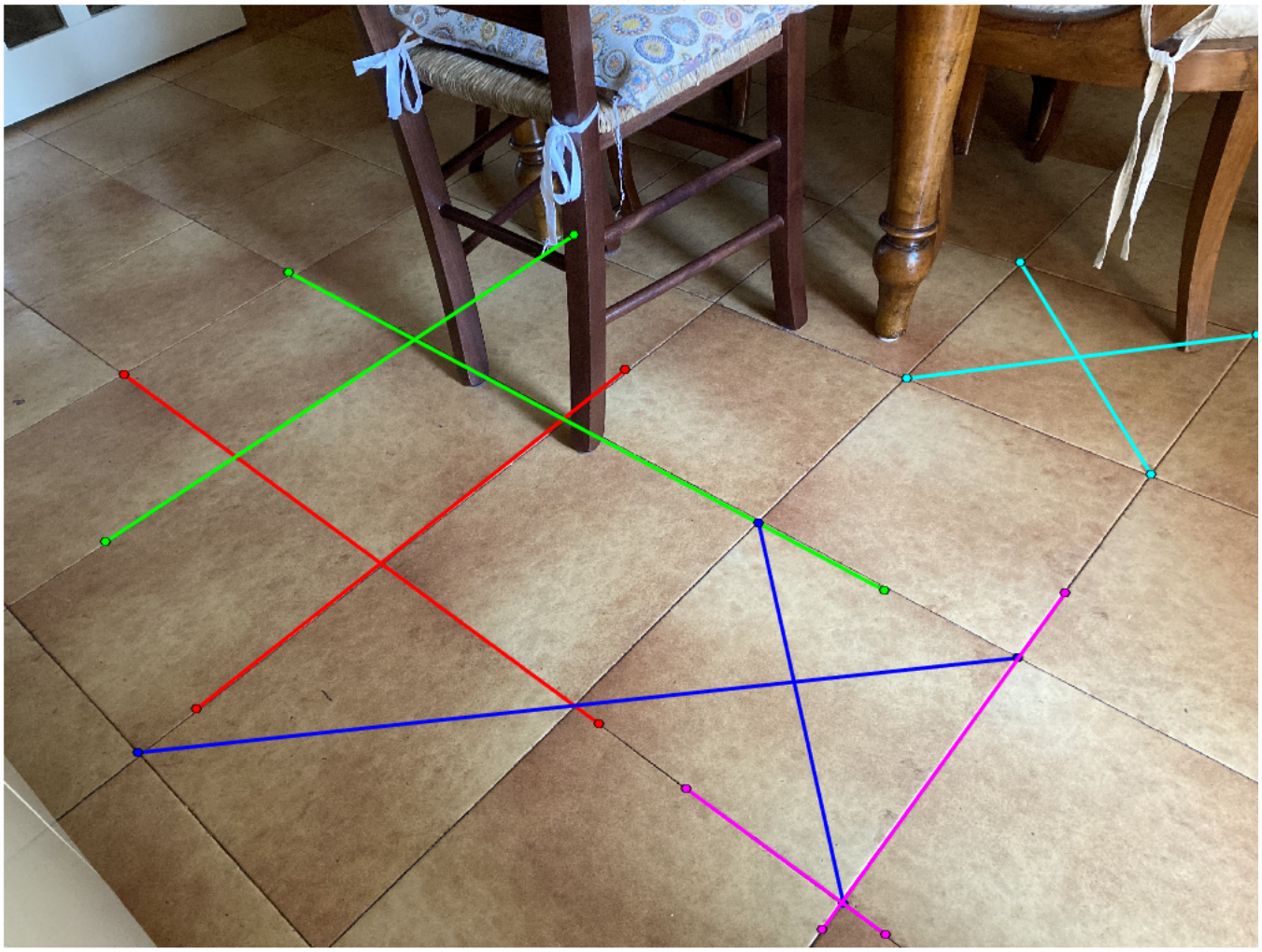
```
[U,D,V] = svd(imDCCP);
D(3,3) = 1;
A = U*sqrt(D);
```

```
C = [eye(2),zeros(2,1);zeros(1,3)];
min(norm(A*C*A' - imDCCP),norm(A*C*A' + imDCCP))

H = inv(A); % rectifying homography
min(norm(H*imDCCP*H'./norm(H*imDCCP*H') - C./norm(C)),norm(H*imDCCP*H'./norm(H*imDCCP*H') + C./norm(C)))
```

```
ans =

   3.2456e-08


ans =

   3.2456e-08
```

```
tform = projective2d(H');
J = imwarp(img,tform);

figure;
imshow(J);
```

Draw 5 pairs of orthogonal segments: step 5



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