

Affine rectification from pairs of parallel lines

perform an affine rectification of an image. Given two pairs of image of parallel lines, the script find the image of the line at infinity as the ones passing through the vanishing points. The homography that maps the line at infinity to its canonical form: (0: 0: 1) rectify the image up to an affinity transformation.

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load the image

```
clear;
close all;
img = imread('E4_data/img1.JPG');
figure; imshow(img);
title("Draw two pairs of parallel segments and press enter")
```



select two pairs of segments that are image of parallel lines in the scene

```
fprintf('Draw parallel segments\n');

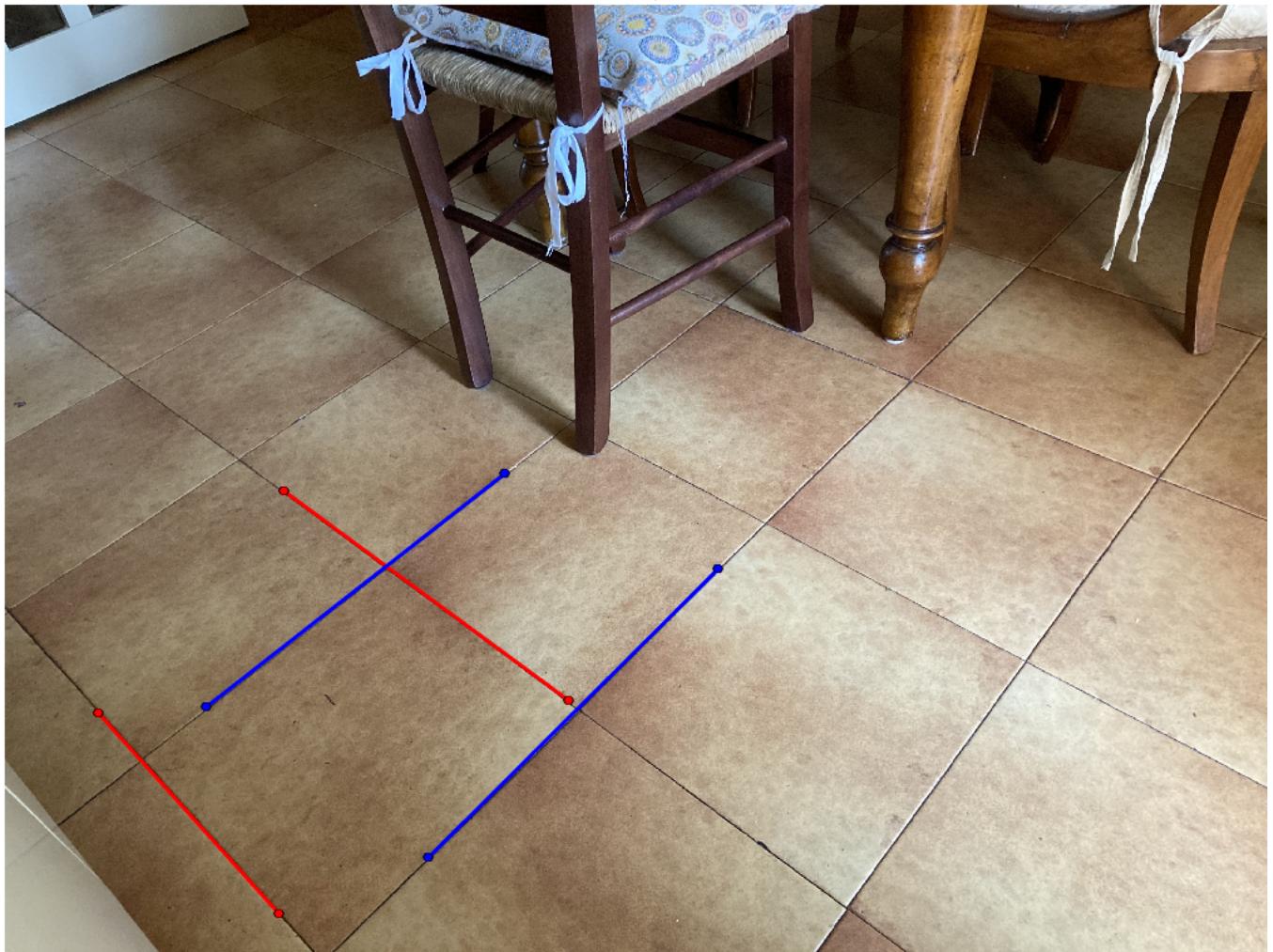
% select a first pair of segments (images of 2 parallel lines)
segment1 = drawline('Color','red');
segment2 = drawline('Color','red');

% select a second pair of segments (images of 2 parallel lines)
segment3 = drawline('Color','blue');
segment4 = drawline('Color','blue');
```

```
fprintf('Press enter to continue\n');
pause
```

Draw parallel segments
Press enter to continue

Draw two pairs of parallel segments and press enter



compute the image of the line at infinity

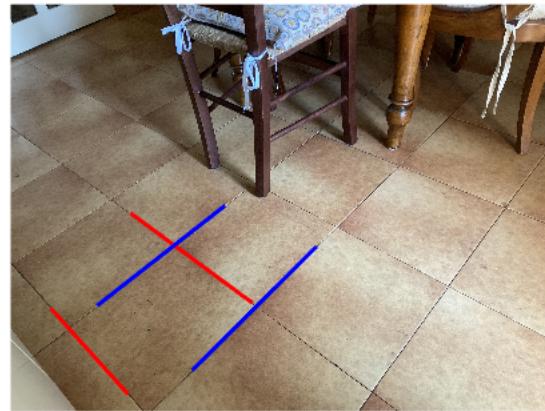
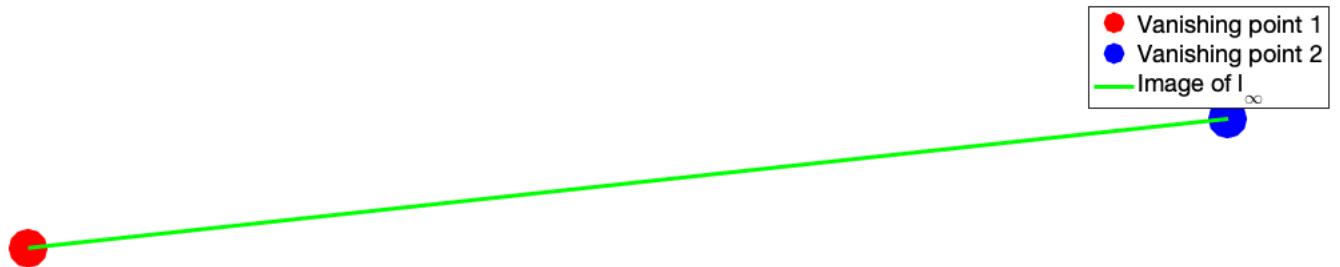
```
l1 = segToLine(segment1.Position);
l2 = segToLine(segment2.Position);

m1 = segToLine(segment3.Position);
m2 = segToLine(segment4.Position);

% compute the vanishing points
L = cross(l1,l2);
L = L./L(3);
M = cross(m1,m2);
M = M./M(3);

% compute the image of the line at infinity
imLinfy = cross(L,M);
imLinfy = imLinfy./imLinfy(3);

% dispaly the selection
figure;
hold all;
% plot vanishing points
plot(L(1),L(2),'r.','MarkerSize',100);
plot(M(1),M(2),'b.','MarkerSize',100);
imshow(img);
% plot vanishing line
line([L(1),M(1)],[L(2),M(2)],'Color','Green','LineWidth',3);
% plot selected segments
line([segment1.Position(1,1),segment1.Position(2,1)],[segment1.Position(1,2),segment1.Position(2,2)],'Color','red','LineWidth',3);
line([segment2.Position(1,1),segment2.Position(2,1)],[segment2.Position(1,2),segment2.Position(2,2)],'Color','red','LineWidth',3);
line([segment3.Position(1,1),segment3.Position(2,1)],[segment3.Position(1,2),segment3.Position(2,2)],'Color','blue','LineWidth',3);
line([segment4.Position(1,1),segment4.Position(2,1)],[segment4.Position(1,2),segment4.Position(2,2)],'Color','blue','LineWidth',3);
hold off;
legend('Vanishing point 1', 'Vanishing point 2','Image of l_\infty');
set(gca,'FontSize',20)
```



build the rectification matrix

```
H = [eye(2),zeros(2,1); imLinfy(:)'];
% we can check that H^-T* imLinfy is the line at infinity in its canonical
% form:
% compute the rectifying matrix
fprintf('The vanishing line is mapped to:\n');
disp(inv(H)'*imLinfy);
```

The vanishing line is mapped to:

```
0
0
1
```

rectify the image and show the result

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

figure;
imshow(J);
imwrite(J,'images/affRect.JPG');

Error using imwrite (line 548)
Unable to open file "images/affRect.JPG" for writing. You might not have write permission.

Error in E4A_affine_rectification (line 89)
imwrite(J,'images/affRect.JPG');

figure;
imshowpair(img,J,'diff');
```

