Horizon from equally spaced lines and affine rectification

Identify pairs of equispaced parallel planar lines in an image. Compute the vanishing line and use it to perform an affine rectification of the plane.

Reference: Hartely Zisserman 8.23 .\\°//.\\°//.\\°//.\\°//.\\°//.\\°//.\\°//.\\°//.\\°//.\\°//.\\°//.\\°//.

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Contents


```
clc;
clear;
```

load an image of a plane

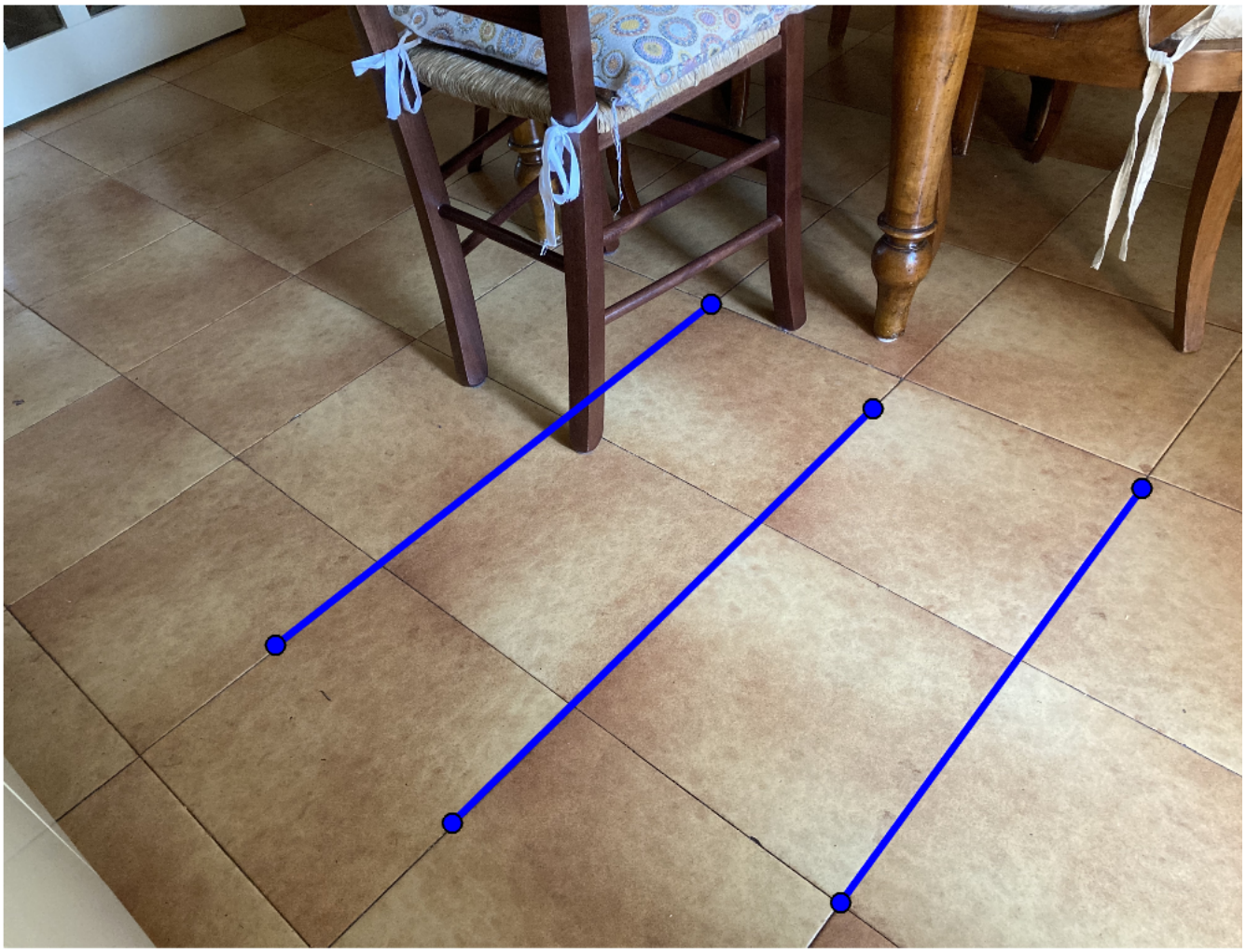
```
im = imread("E2_data/floor.jpg");
im = imresize(im,0.5);
```

select three lines that are equally spaced in the scene

```
figure; imshow(im);
for i =1:3

    seg{i} = drawline('Color','b');
    % convert the segments to line

    a = [seg{i}.Position(1,:)';1];
    b = [seg{i}.Position(2,:)';1];
    % get the parameters of the line
    lines{i} = cross(a,b);
end
```



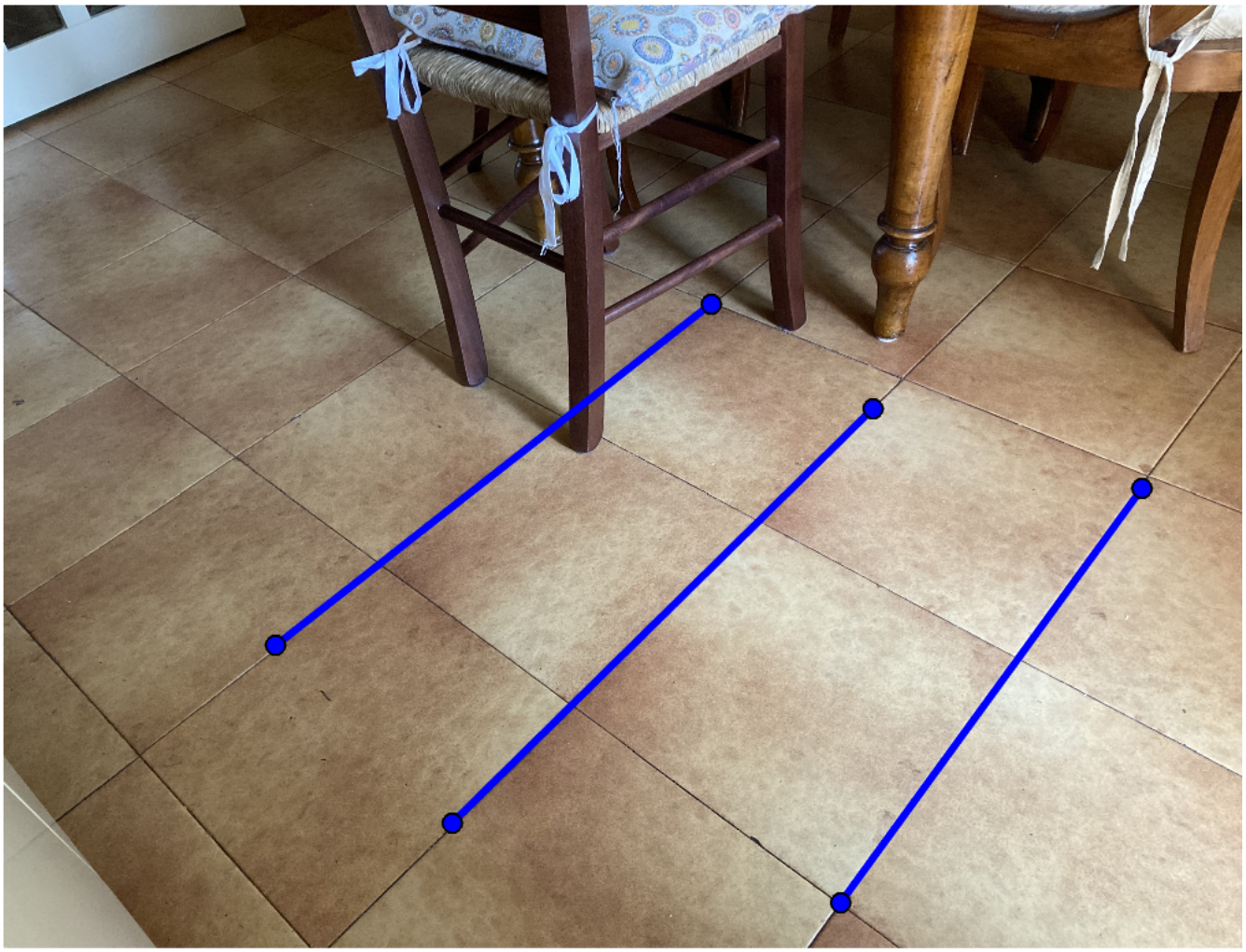
compute the horizon

```
l0 = lines{1};
l1 = lines{2};
l2 = lines{3};

l= (cross(l0,l2)'*cross(l1,l2))*l1 +2*(cross(l0,l1)'*cross(l2,l1)*l2);
horizon = l./norm(l);

% identify two points on the line ax+by+c=0
% x = 0 -> y = -c/b
P1 = [0; -horizon(3)/horizon(2)];
% x = size(img,2) -> y = -(ax+c)/b
P2 = [size(im,2); -(horizon(1)*size(im,2)+horizon(3))/horizon(2)];

figure(gcf);
hold on
line([P1(1),P2(1)],[P1(2),P2(2)],'Linewidth',4,'Color','b');
```



Given the horizon we can rectify the image

```
horizon = horizon./norm(horizon); % super important to regularize the homgraphy
H = [eye(2),zeros(2,1); horizon(:)'];
H = det(H)*H;
% we can check that H^-T* imLinfty is the line at infinity in its canonical
% form:
fprintf('The vanishing line is mapped to:\n');
disp(inv(H)'*horizon);
```

```
The vanishing line is mapped to:
   -0.0000
         0
   -1.0000
```

rectify the image and display it

```
t = maketform( 'projective', H');
J = imtransform(im,t);
figure;
imshow(J);
```

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