Homography

Description:

Perform homography to map the sign in input image to a rectangle in output image. We need to find a transformation such that the sign board looks perfect rectangle in the output image.

Procedure:

1. Ask user to input 4 corner points of the sign board in the input image. We get vectors [u v]
2. Determine points [x y] of a rectangle from the input points in step 1
    a. x = u
    b. y(1), y(2) = v(1) and y(3), y(4) = v(2)
3. Perform projective transform to obtain the homography matrix H.
4. Use imwarp to apply the transform on our input image.

Observations:

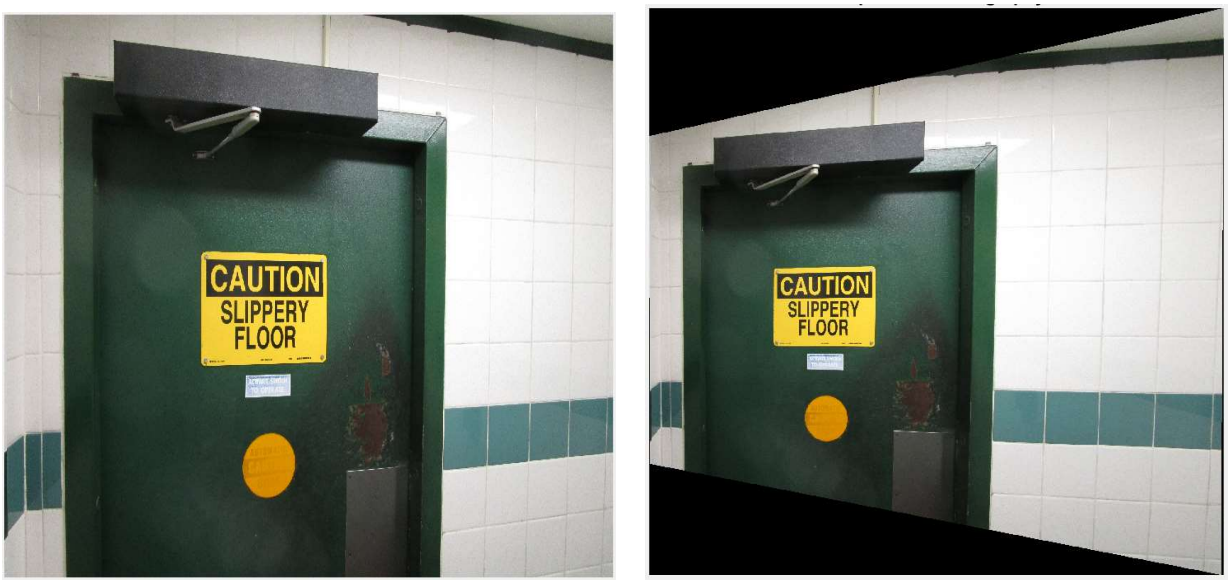

Fig. input image(left) with sign board; transformed image(right) after homography

- When we perform homography, we only focus on a specific region and try to fix the appearance of that region only, this is the reason why we see the black portion in output image (we only focus on the sign board in the given task).
- The area of the output image is less than the area of input image.
- The output image shows a different perspective of the scene (seems like we changed the viewpoint of our camera).

Learnings:

- The homography matrix helps us perform the transformation from points in one plane to corresponding points in a different plane.
- Function fitgeotrans(movingPoints, fixedPoints, transformType)
    - used to perform geometric transform to map movingPoints in a plane to fixedPoints in another plane.
    - movingPoints are control points in the input image which we want to transform.
    - fixedPoints are control points in the base image which we want our input image to be transformed into.
    - trasnformType we used projective transform to register the input image with respect to a different viewpoint of camera.
    - Output of fitgeotrans is a homography matrix.

- Function imwarp(img, transformation_matrix)
    - Used to apply the homography matrix on the input image.
    - Output of imwarp is a transformed image.
- What we are doing here is changing the viewpoint of our camera to see a plane in our 2D image from a different perspective. The consequence of mapping the 3D world object to 2D image is that we lose one dimension and we try the best we can to fix this using homography.