

### MINES-VIS Assignment 4 Image Transforms.

In many imaging systems, detected images are subject to geometric distortion introduced by perspective irregularities wherein the position of the camera(s) with respect to the scene alters the apparent dimensions of the scene geometry. Applying an affine transformation to a uniformly distorted image can correct for a range of perspective distortions by transforming the measurements from the ideal coordinates to those actually used. ( For example, this is useful in satellite imaging where geometrically correct ground are desired.) See example at the end of this document.

#### Exercise (1)

Collect minimal a set of 4 point correspondences of the book on “imageA.jpg” and “imageB.jpg” hereinafter called **A** and **B** respectively and calculate the transformation matrix  $T_{\text{exer1}}$  for  $A \rightarrow B$ .

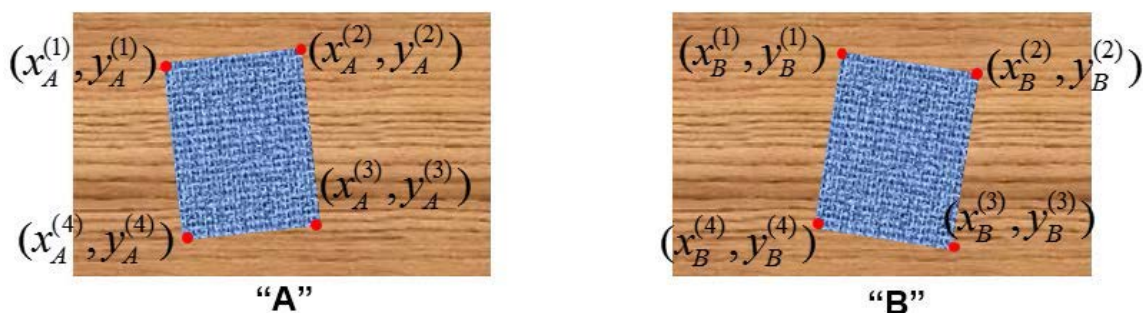


Figure 1 Example of A and B

Can you extract the rotation angle from the matrix  $T_{\text{exer1}}$ ?

#### Exercise (2)

Now perform a Transformation from  $A \rightarrow C$  using  $T_{\text{exer1}}$ . Compare the original **B** with the obtained **C** by performing a subtraction between **B** and **C** and comment your results.

#### Exercise (3)

Repeat exercise(1) and exercise(2) using more than 4 corresponding points of **A** and **B**. Show and comment your results.

#### “The OrthoWall”

#### Exercise (4)

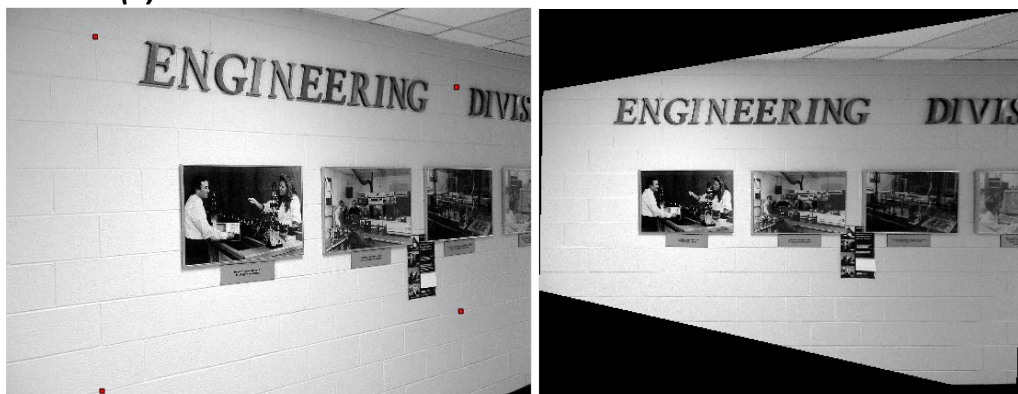


Figure 2 Orthophoto example. “The OrthoWall”;

Execute a Transformation on image “wall1.jpg” or “wall2.jpg” to obtain a similar result as shown in Figure 2. Show your results including the obtained transform matrix.

### Exercise(5)

In many televised sports events, advertisement are virtually inserted in live video feed. E.g. in football and baseball the ads placed on small advertisement boards right outside the boundary of the field can be virtually changed. Instead of displaying the same ad to everybody, advertisers can choose which ads to show based on the person’s demographics, location etc. In these applications the four corners of the advertisement board are detected in the video which serve as the destination points. The four corners of the ad serve as the source points. A homography is calculated based on these four corresponding points and it is used to warp the ad into the video frame.

Replace the ad as shown in Figure 3 in the four corners marked with an arrow with the new ad as shown in Figure 4.



Figure 3 Advertisement. Corners are marked with arrows.



Figure 4 New Advertisement for Figure 3

Show your results on a well-documented report including sources comments, conclusions and recommendations if necessary. You can discuss your results with other students but hand in your own work!



# Example: Registering an Aerial Photo to an Orthophoto



*Unregistered as it was taken from an airplane and is distorted relative to the registered ground image, the Orthophoto.*



*The Orthophoto, registered ground image*



*View Registered Image in Context of Orthophoto*