IMAGE MOSAICING

SUBMITTED BY-

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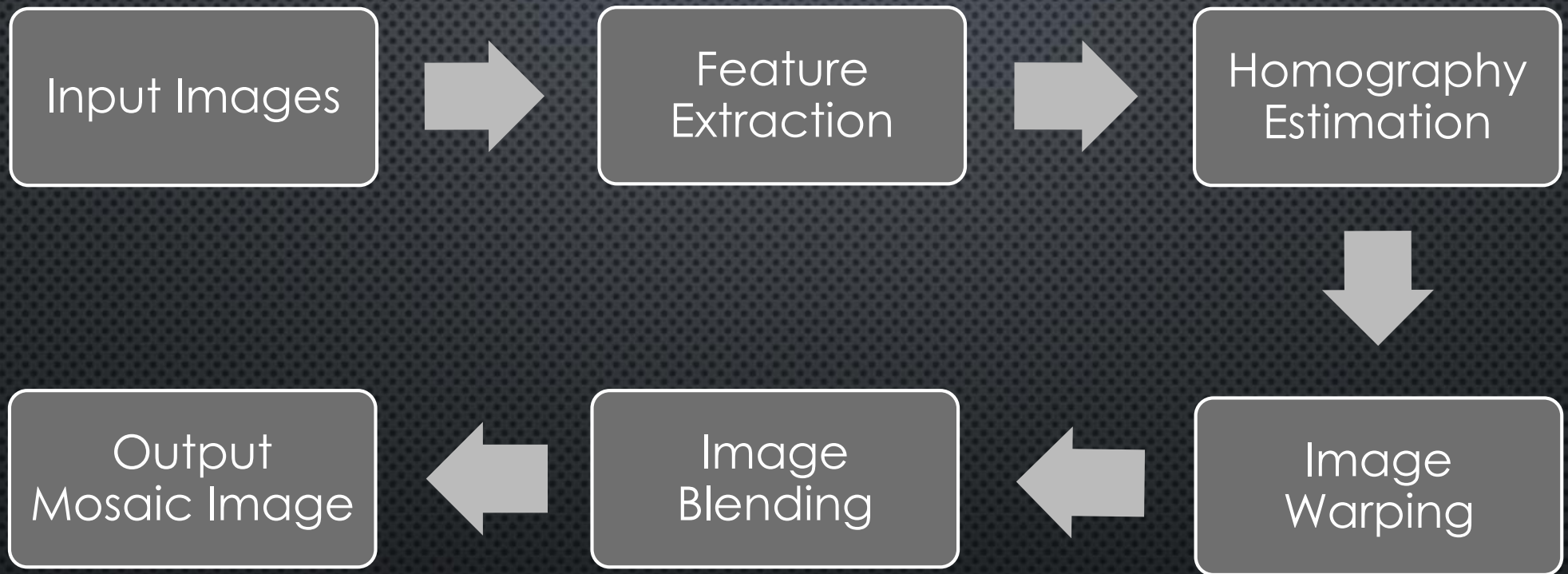
What is image mosaicing?

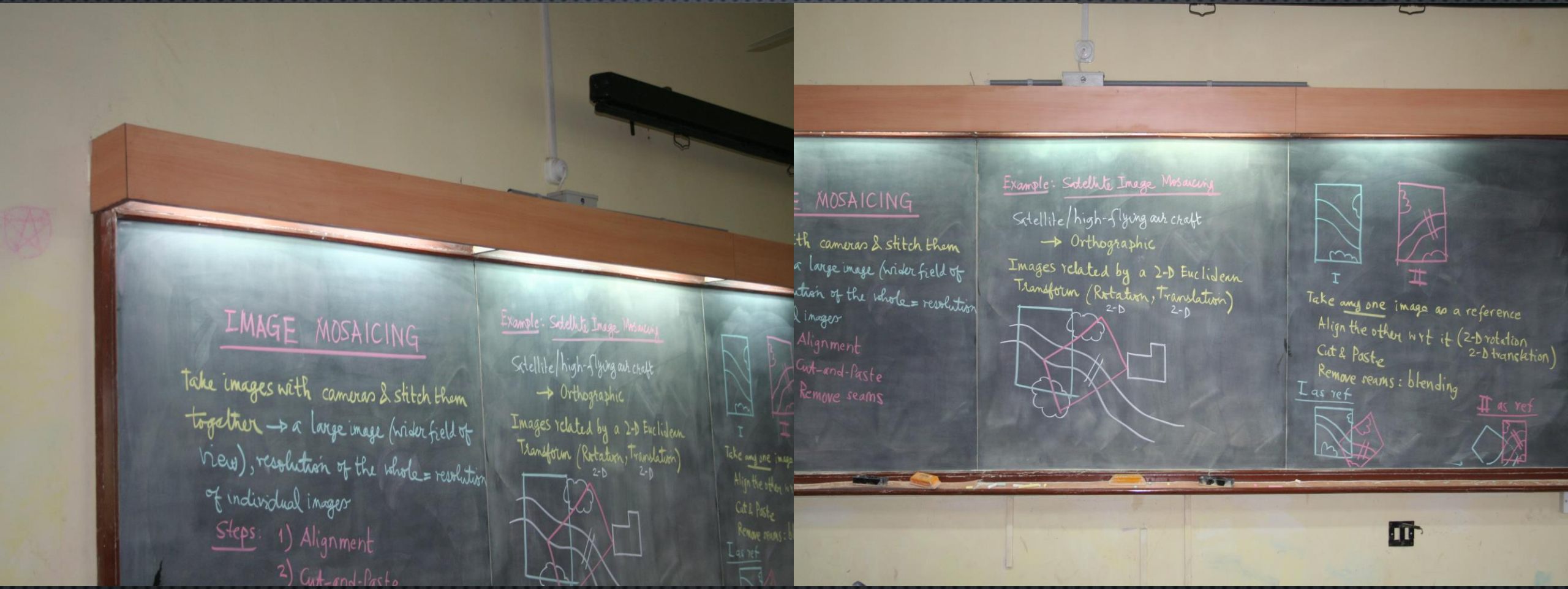
- Mosaicing is the process of assembling a series of images and joining them together to form a continuous seamless photographic representation of the image surface.
- This results in an image with a field of view greater than that of a single image.

USES OF IMAGE MOSAICING

- Many a time, it may not be possible to capture the complete image of a large scene in a single exposure as most image capturing media work with images of definite size and because of their inherent limit.
- In such cases, the scene has to be scanned part by part producing split images. Thus, to view whole scene require mosaicing of the split images to obtain a complete final image of the scene
- Therefore, image mosaicing allow us to create a large field of view using normal camera.

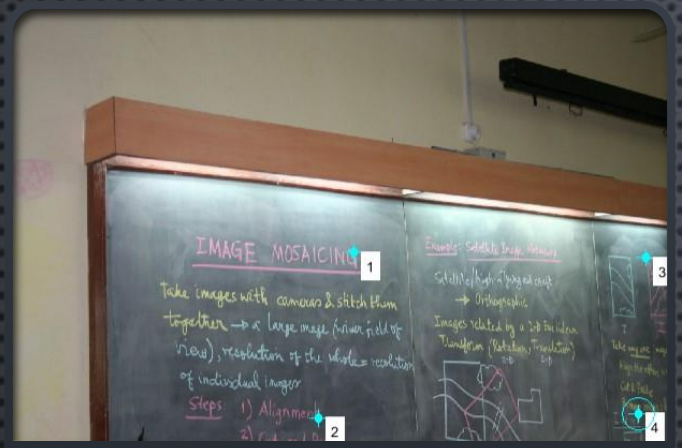
STEPS IN IMAGE MOSAICING

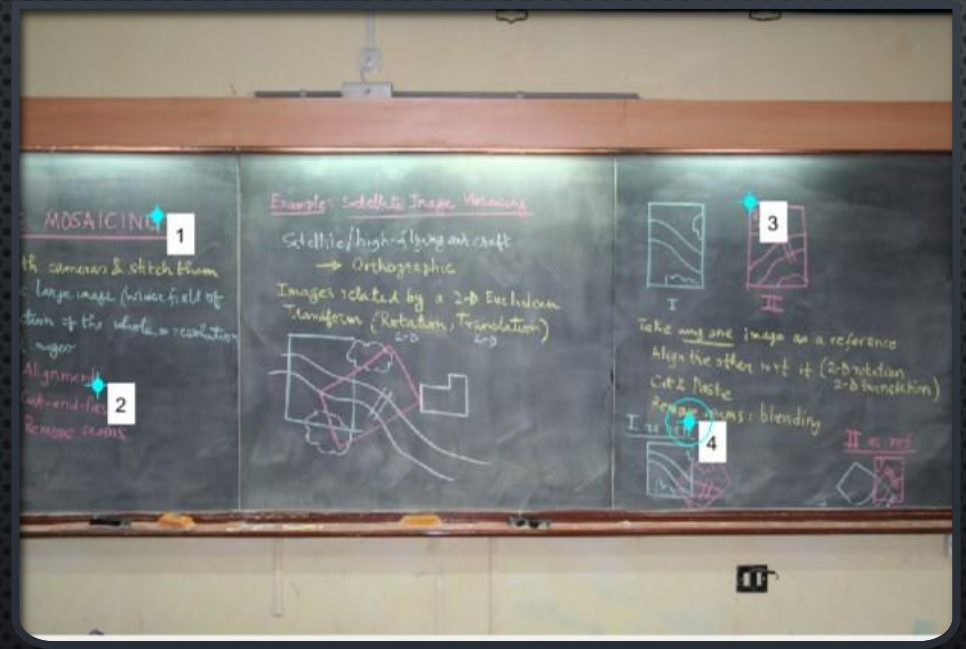




1. INPUT IMAGES

WE TAKE THESE TWO INPUT IMAGES AS OUR EXAMPLE.





2. FEATURE EXTRACTION

- FEATURE MATCHING MATCHES COMMON POINTS IN TWO IMAGES THAT HELPS IN COMPUTING HOMOGRAPHY MATRIX.
- ALGORITHMS LIKE SURF/SIFT CAN BE USED TO DETECT AND MATCH FEATURES IN IMAGES.
- HERE WE'VE DONE MANUAL MATCHING BETWEEN TWO IMAGES.

$$\begin{bmatrix} h_1 & h_2 & h_3 \\ h_4 & h_5 & h_6 \\ h_7 & h_8 & h_9 \end{bmatrix} \begin{bmatrix} u \\ v \\ 1 \end{bmatrix} = \begin{bmatrix} u' \\ v' \\ 1 \end{bmatrix} \Leftrightarrow \begin{cases} uh_1 + vh_2 + h_3 = u' \\ uh_4 + vh_5 + h_6 = v' \\ uh_7 + vh_8 + h_9 = 1 \end{cases} \Leftrightarrow \begin{bmatrix} 0 & 0 & 0 & -u & -v & -1 & v'u & v'v & v' \\ u & v & 1 & 0 & 0 & 0 & -u'u & -u'v & -u' \\ -v'u & -v'v & -v' & u'u & u'v & u' & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} h_1 \\ h_2 \\ h_3 \\ h_4 \\ h_5 \\ h_6 \\ h_7 \\ h_8 \\ h_9 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \Leftrightarrow A\mathbf{h} = \mathbf{0}$$

$$\begin{bmatrix} 0 & 0 & 0 & -u_1 & -v_1 & -1 & v_1'u_1 & v_1'v_1 & v_1' \\ u_1 & v_1 & 1 & 0 & 0 & 0 & -u_1'u_1 & -u_1'v_1 & -u_1' \\ 0 & 0 & 0 & -u_2 & -v_2 & -1 & v_2'u_2 & v_2'v_2 & v_2' \\ u_2 & v_2 & 1 & 0 & 0 & 0 & -u_2'u_2 & -u_2'v_2 & -u_2' \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \end{bmatrix} \begin{bmatrix} h_1 \\ h_2 \\ h_3 \\ h_4 \\ h_5 \\ h_6 \\ h_7 \\ h_8 \\ h_9 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ \vdots \end{bmatrix}$$

$$A\mathbf{h} = \mathbf{0}$$

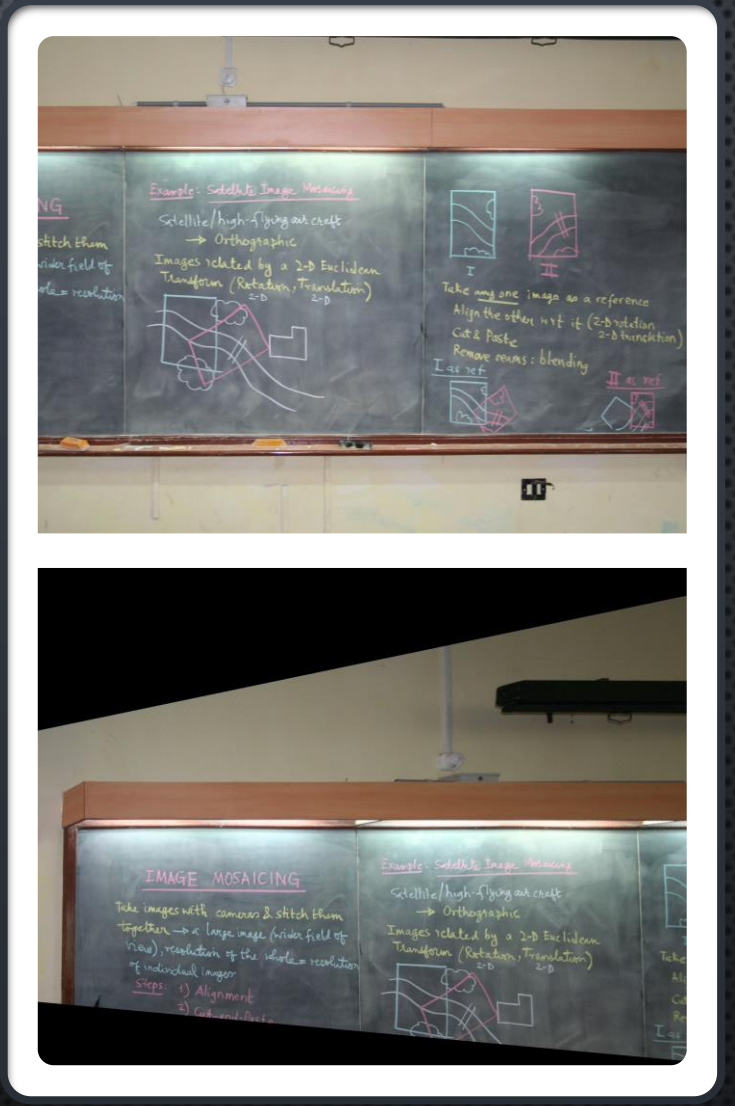
3. HOMOGRAPHY ESTIMATION

GIVEN ENOUGH POINTS (AT LEAST 4), WE CAN FIND THE HOMOGRAPHY MATRIX USING SVD (SINGULAR VALUE DECOMPOSITION).

4. IMAGE WARPING

- We used the previously computed homography matrix and through corner registration we find the new size of the warped image.
- Using inverse homography matrix we find each point (x',y') in the image(2) that locates in image(1) (x,y).
- On finding the (x,y) we assign the [r g b] color values of image(1) to the pixel located at (x',y') in image(2) with some translation for image bounds.

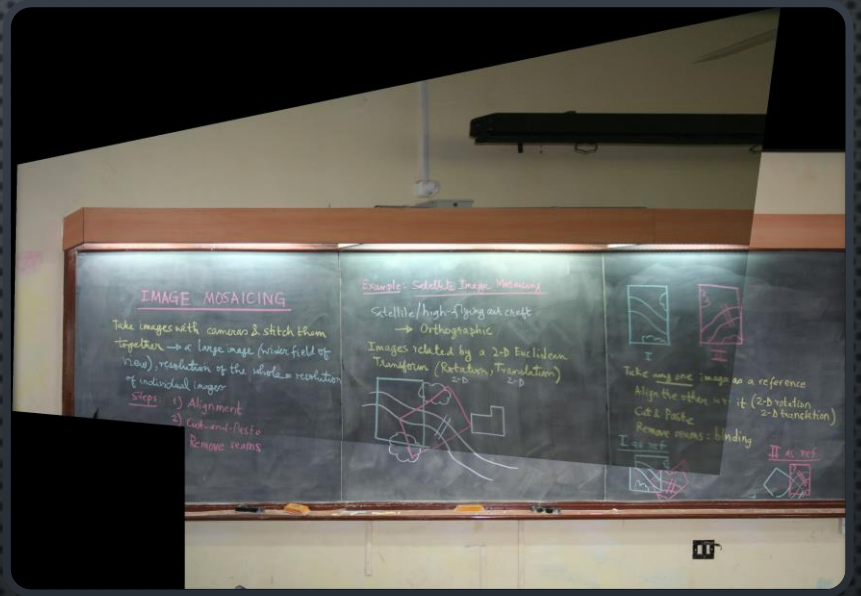
$$T^{-1}\mathrm{X}' = \mathrm{X}$$



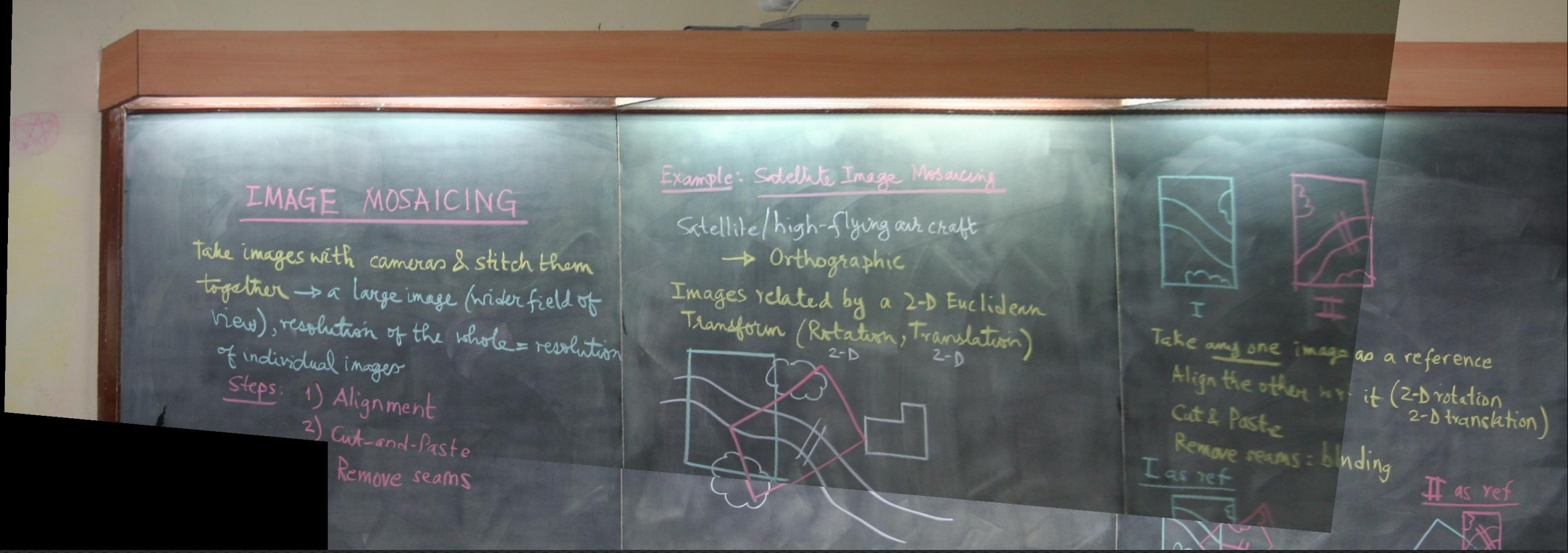
WARPED IMAGE(2) BASED ON IMAGE(1)

5. IMAGE BLENDING

- We did further translation in the images to map the right point in both images distorted due to translation during warping in maintain image bounds.
- Blending the image result in mosaic of both the images. (Here just putting one image over the other)
- As there is only two images as input our blended images and final mosaic image is same.
- We can further do histogram equalisation for better result over change in brightness.



Blended Image



6. MOSAIC IMAGE

FINALLY DISPLAY THE OUTPUT IMAGE

THANK YOU