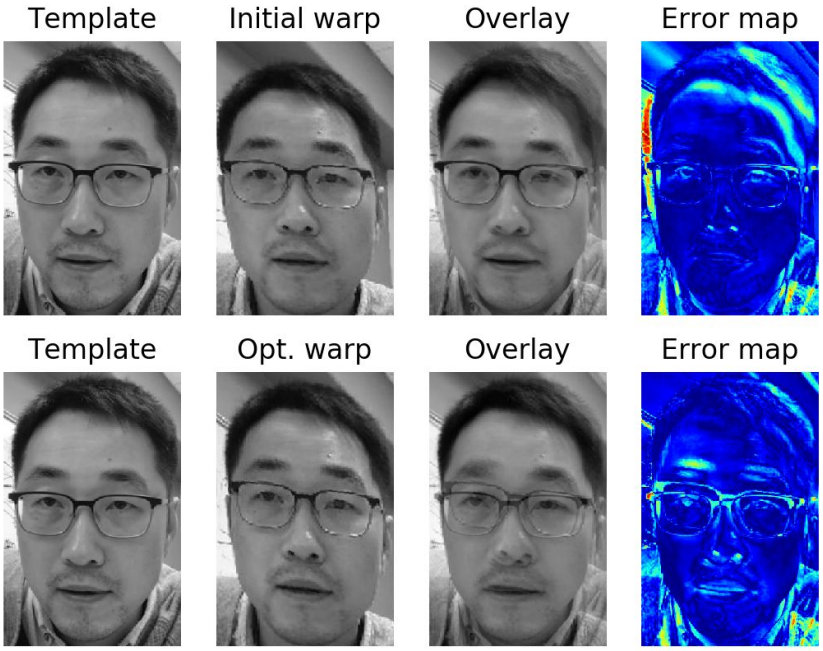
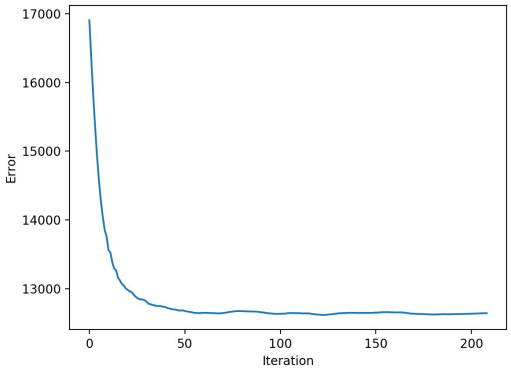
Homework-2

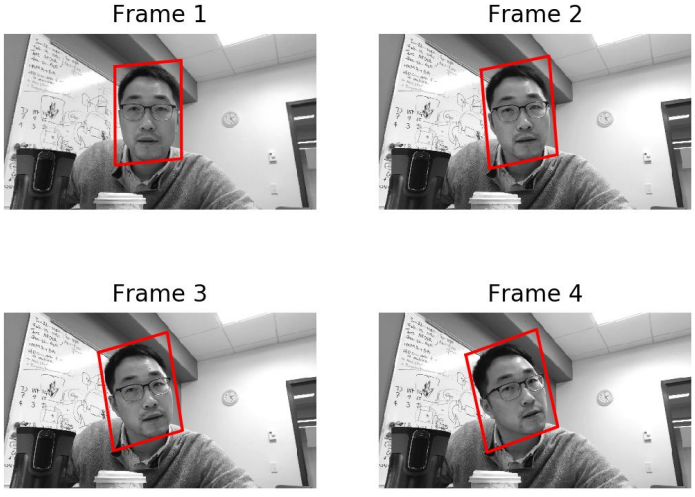
(a)



(b)



(c)



(d)

Figure (a) – **SIFT Keypoints with ratio test**; *Figure (b)* – **Image alignment using Inverse Compositional Image Alignment**; *Figure (c)* – **I_error and iteration map** *Figure* (d) – **Multiple Image Tracking**

Summary:

Keypoint descriptors are taken between image using CV2 sift functions. The key points are filtered based on ratio test with a threshold of 0.7. These keypoints are used to find the affine transformation A using RANSAC. A ransac threshold of 15 is taken and is run for 1000 iterations.To solve for A, 3 keypoint pairs are sampled at random. The affine transformation with the max number of inliers is returned. Wrapping of image is done using reverse mapping process where all the target values are filled using corresponding template values. Points out of bounds in template are ignored. Aligning image is done using Inverse compositional image alignment method. First the differential images are calculated and stacked. Next the jacobian Matrix is calculated. Steep descent images matrix(SDI) is calculated by multiplying differential matrix and jacobian. SDI matrix is multiplied by its transpose to get all the hessian values which are summed over all x to get the Hessian Matrix(H). An optimization loop is run with the ||p|| > 0.001 threshold. Target image is warped with template size and p initialized from A. I_error is calculated and magnitude is stored for errors map. F is calculated using H and I_error matrices. Change to p is calculated using H and F matrices. Change in P is translated to change in A and the loop is repeated. The final A and errors is returned. In multiple image tracking, initial A is calculated from find_match and align_image_using_feature methods. Then image alignment is run sequentially across all the target images. Template is wrapped at each run to new template using updated A.
All A's are compiled in a list and returned.