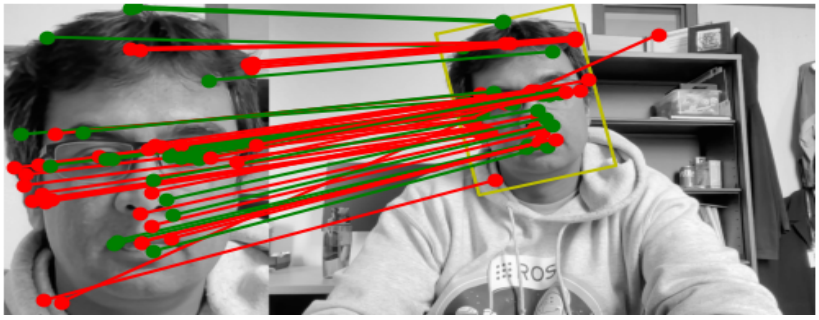
CSCI 5561 (Computer Vision)
Homework 2 Summary

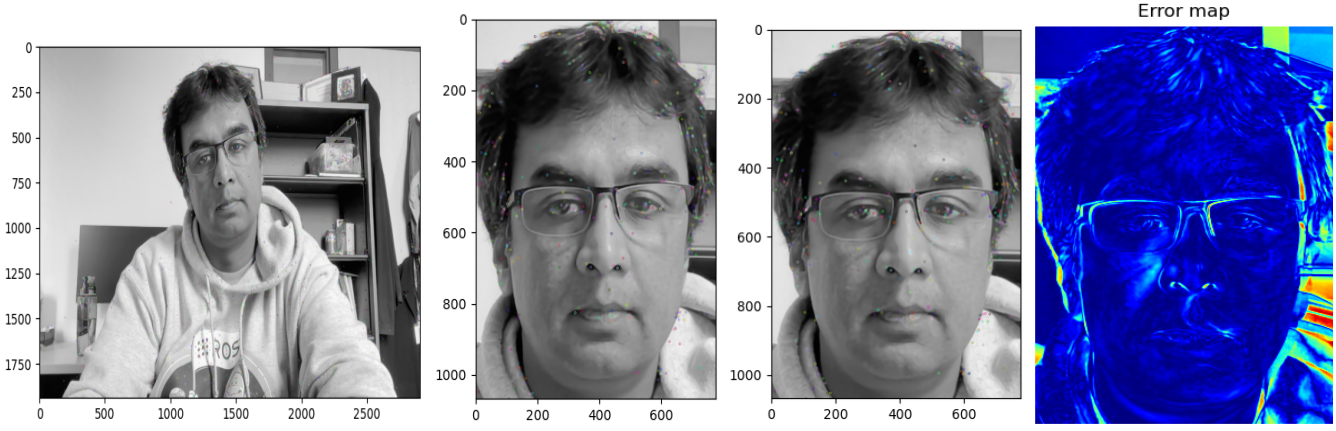
Name: Sai Pratyusha Attanti
Email: attan005@umn.edu
Student ID: 5656785

1. Finding match - Initially, we perform SIFT feature extraction for the given template and target image. From these feature descriptors, we find match between images using nearest neighbors with the ratio test (threshold = 0.7) and return the corresponding matching points.

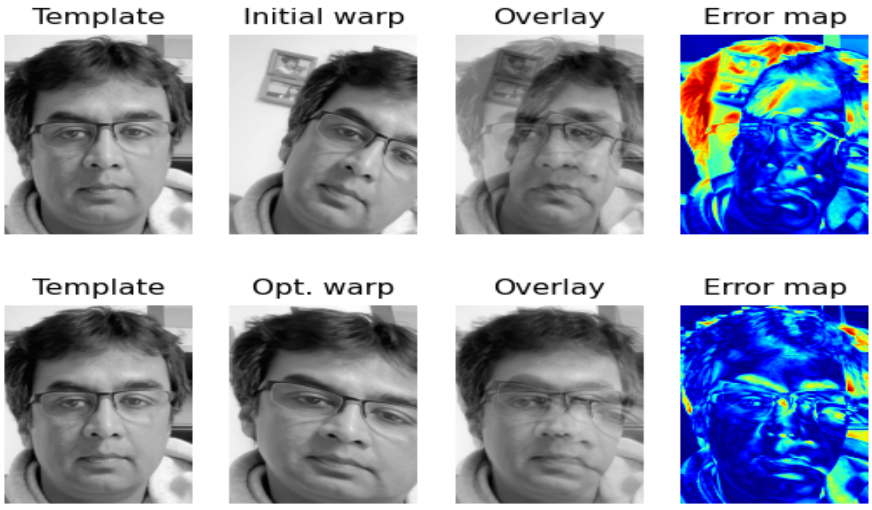
2. Feature-based image alignment - Now we will compute affine transform from template image to target from the above SIFT matches such that x1 can be transformed to x2 (x1 = Ax2). So we randomly choose four points from each list for 1000 RANSAC iterations and calculate the affine transform and then take the number of points that are correctly transformed using the RANSAC threshold of 30. Now we take the affine transform that gives the maximum number of correct points i.e inliers and returns it.



3. Image Warping - Now we apply this affine transform to warp the target image to the template image.



4. Inverse Compositional Image Alignment - Now we will be using the above affine transform to track the template image in the next target image. We will be computing the gradient for our template image, then compute the jacobian and steepest descent for every pixel of the template image. Using this we will compute hessian. Until the error between the warped image and the template is less than the threshold (0.05) or iterations less than 1000 we will refine our affine matrix.



5. Multiframe Tracking - Finally we can implement multi-frame tracking by combing all the above steps. Initially, we take the affine transform for the template and the initial target image. And then use this affine transform and apply inverse compositional image alignment and get the refined affine transform for the next image and then use this to get the refined affine transform for the next image and so on.