



Figure 1: Visualization of Tracked Images

## Summary-Homework:2

The problem is to take a template image and four frames of a scene containing the same person as the template and track the face of the person in the four frames. The algorithm which has been implemented here is Inverse Compositional Image Alignment algorithm.

To this end, I wrote the following functions in MATLAB: FindMatch.m, AlignImageUsingFeature.m, WarpImage.m, AlignImage.m, TrackMultiFrames.m which are compliant with the specifications mentioned in the problem sheet. First, the SIFT matches have been computed between the Template and the first frame as shown in Figure 1(a) and 1(c). The SIFT matches have been shown in Fig 1(g). As we can observe, there are some false matches between the the template and the first frame. These have been removed in the next step by RANSAC. The Consensus used here is Affine Transformation between the Template and the First Frame. The obtained Affine Matrix is initially used to align the template and the target image. Next, the A matrix is refined using the inverse Compositional Image Alignment Algorithm. The steepest descent images are obtained by multiplying the image gradient with the Jacobian of size  $2 \times 6$ . Using this, the change in the parameters of the affine transformation matrix is calculated and the original A matrix parameters obtained in the previous step are updated. This step is repeated till the change in the p parameters is less than a pre-defined threshold, "epsilon" whose value for the captured set of images is set as 0.03 or the maximum iterations reached are 300. As we can see in Fig 1(b), the difference in the template and the warped image decreases, i.e the error decreases with the number of iterations.

To track the images in the consecutive frames, the template is updated everytime as the warped image of the current frame on to the previous frame image. The bounding boxes have been plotted using plot function.