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Our approach

1. Our approach initially involved using the code published by Zhu and Ramanan based on a paper called "Face Detection, Pose Estimation and Landmark Localization in the Wild" to perform landmark detection on the input or reference faces. So far, one of most challenging sub-problems we've encountered has to do with obtaining a clear outline of the face, specifically the jawline. The code by Zhu and Ramanan performs this task fairly well in most test images we've tried.

2. Using the initial points, we then compute the convex hull of the faces in both images. This allows us to calculate a polygonal mask of the reference image and an inverse mask of the target image. We will later use both to extract the actual face from the input image and create a hole in the target image for adding the convex hull of the reference image.

3. After trying many different approaches involving localized feature detection in order to match points with no real success, we finally found code published by Serge Belongie, Jitendra Malik and Jan Puzicha on matching point features using Shape Context. Their code uses Hungarian Bipartite graph matching and gave us almost perfect point correspondence between the reference and target image as can be seen in our results on the next page.

4. Now, our goal is to use those corresponding points from both images to do TPS morphing, repeating the previous steps until the points from both overlap to within some tolerance level.

5. Finally, we will use Laplacian blending to ensure a smooth transition from our face into the surrounding target image.

Our results

Figure 1: Shape context point matching