Methodology

1. Original image
2. Detect the face and feature points
3. Crop and rotate the face so it’s upright.
4. Find lip centre
5. We use a triangular mesh head model which can be rotated at any yaw, pitch, and roll.
6. The head model is cropped to cover only the area we are interested in.
7. The cropped model is rotated to a frontal view. From this angle, we see that it’s simply a 2D array of 96 x 64 triangles.
8. We find the location of the landmarks on the face.
9. We can extract the triangle coordinates of each feature on the head model.
10. We re-size the cropped and aligned image to 96 x 64 pixels.
11. The face is warped so that the landmarks are in the right location.
12. Note that the triangles in the head model are uniform. This means that we can directly map a pixel to a rectangle. Each triangle is filled with the pixel intensity at its corresponding coordinate on the head model.

Results

The input is a face at a 0 degree angle. We present the reconstructed face viewed from 9 different viewpoints.

Input face at a 45 degree angle. Reconstructed face viewed from 9 different viewpoints.

By testing our model on a variety of images at different poses, our experiment demonstrates that we are capable of recovering an accurate 3D model for faces under 70 degrees of rotation. Our system is therefore limited to faces where both eyes are visible.

Conclusion

By exploiting the global similarities or faces, we are able to use a generic head model to reconstruct a 3D face.

Our method does not require to store a database with various representations of a person because only one image is visible.

Future Work

Extend the system to poses over 70 degrees by using symmetrical properties of the face.

Extracting more facial features to have better control over the mapping.

Deforming the generic model to modify the head shape according the the photo.

References