CAP 6419 – 3D Computer Vision

HW5

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Introduction:

In this assignment, we are required to create 3D models of faces using only a single 2D image. The process to do this is known as simulated stereoscopic imaging. This process mainly works by choosing some landmark points on an input image manually using ginput() function from matlab and then the corresponding landmark points on the mirrored image are also automatically chosen. Once these points have been chosen, the next step then is to then use the extended version of the Cao-Foroosh calibration that was provided in this assignment. This assignment uses these feature points and calculates the two projection matrices P1 and P2 for the original image and the mirrored image, respectively. Also, this function also calculates the homography matrix that can be used to map every feature point in the original image to its corresponding point in the mirrored image. This function also returns coordinates of the chosen feature points.

Once this function has been run, first of all, we rectify the feature points from the input original image and the mirrored image, respectively. We do so by using the rectifying homography matrix obtained from the earlier function. Once the feature points have been rectified, the next step is to then triangulate these points so as to obtain the 3d points for the image. This is done by using the matlab function called triangulate().

Once the points have been triangulated, the last step is to use the matlab function called scatter3() to obtain 3d plot of the input image. For better viewing and understanding, image output from scatter3() can be opened as a .fig file in the image editor of matlab and can be rotated to view the 3d model that has been created as a result of the stereoscopic imaging.

Analysis and Results

The aforementioned procedure was coded in matlab and applied on the three provided input images and also one external image. The code worked very nicely and was able to create very realistic 3d models of all the input images. The interesting thing was how well this imaging method performed in creating 3d models that were similar to how the human eye would envisage when looking at a 2d image.

Spock Image Example

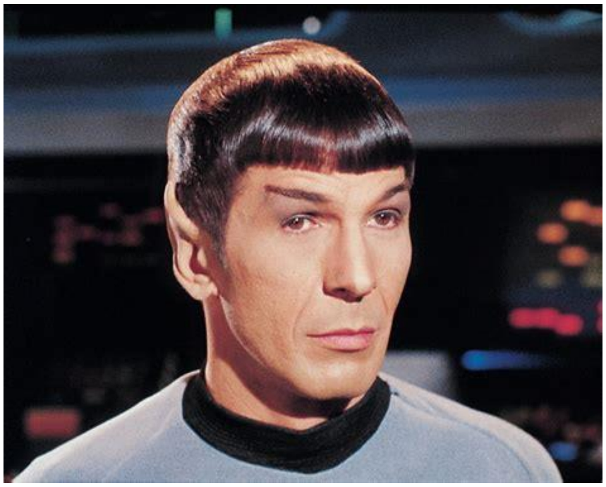

Figure 1: Spock Input Image

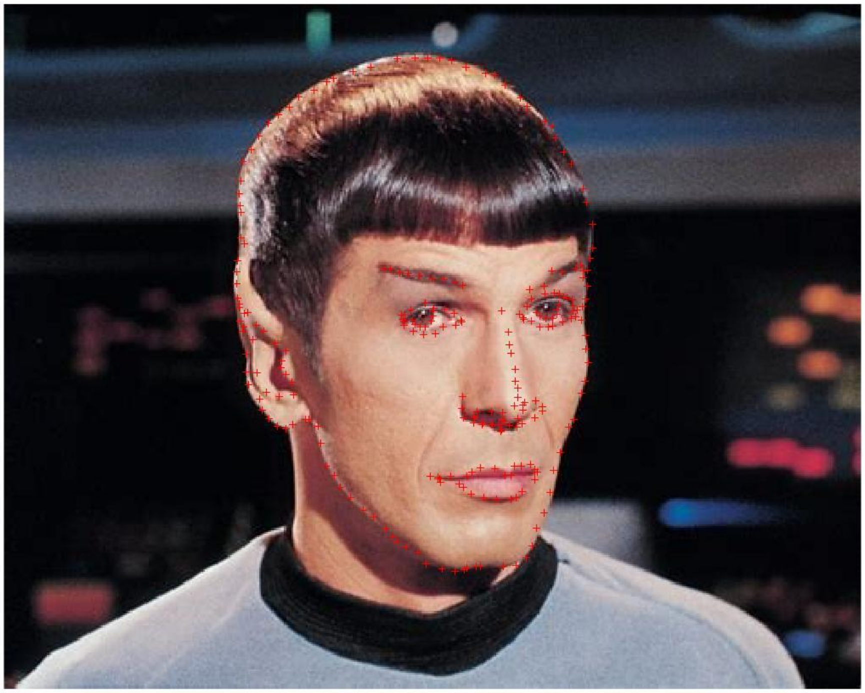

Figure 2: Spock Feature Points

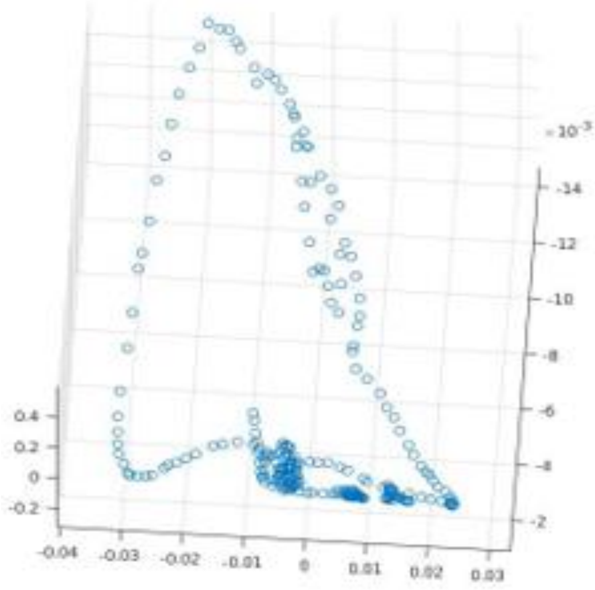

Figure 3: Spock 3D-model View1

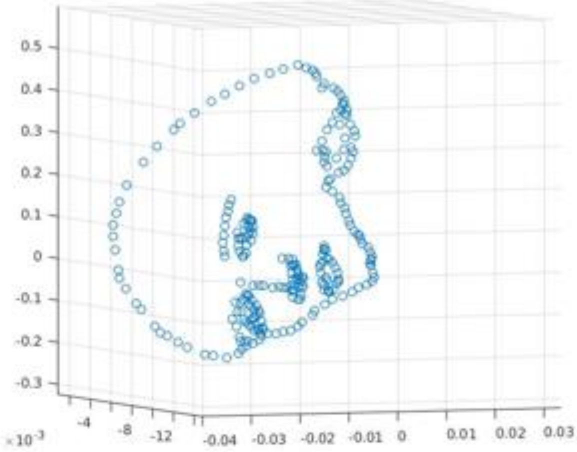

Figure 4: Spock 3D-model View2

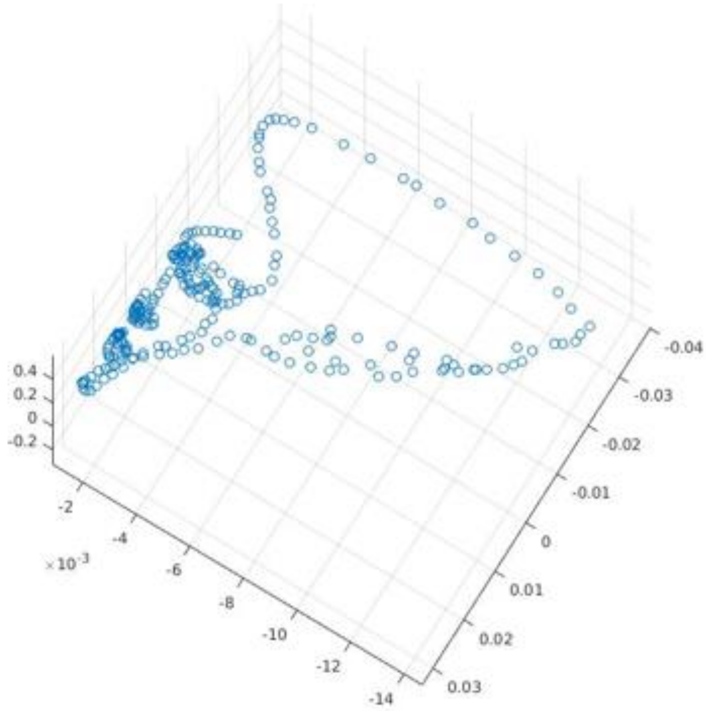

Figure 5: Spock 3D-model View3

Kirk Image Example

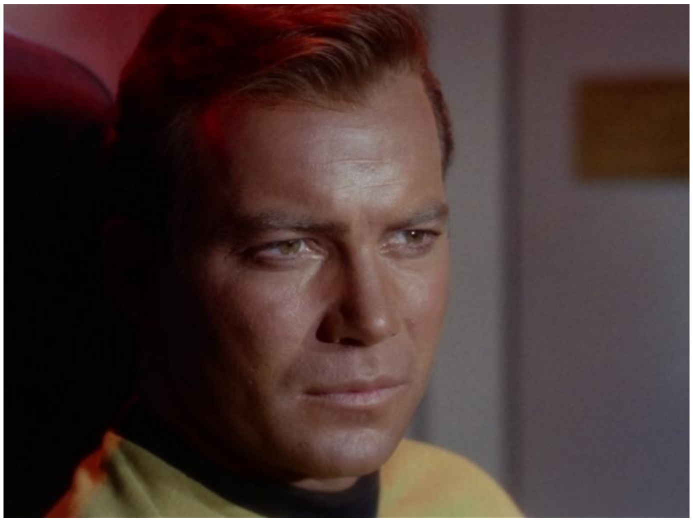

Figure 6: Kirk Input Image

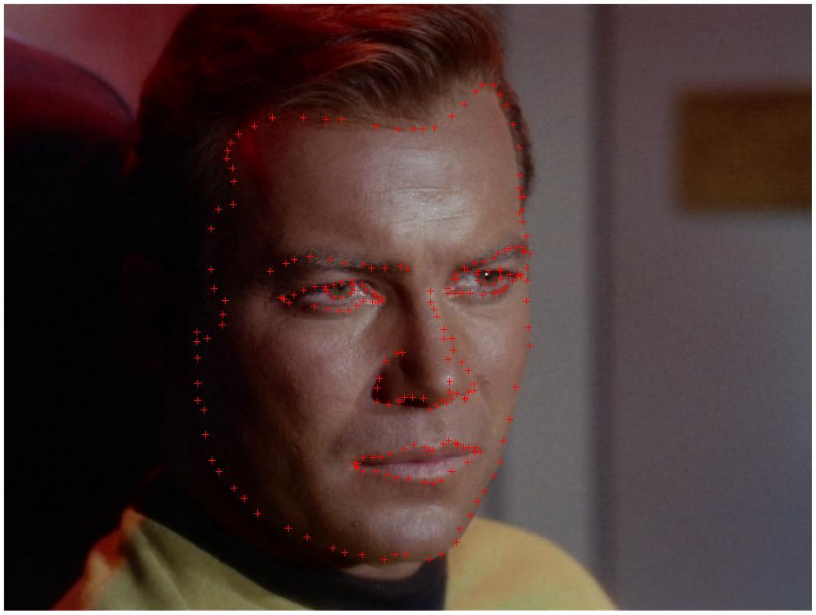

Figure 7: Kirk Feature Points

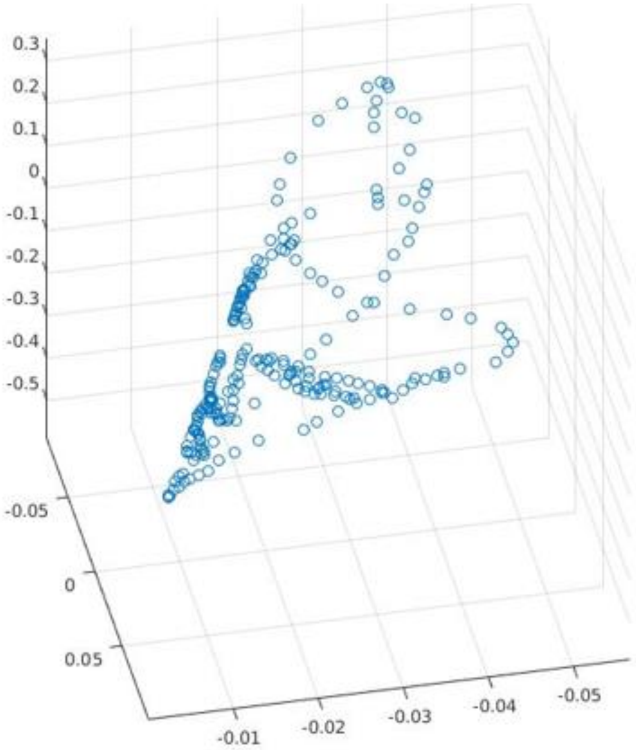

Figure 8: Kirk 3D-model View1

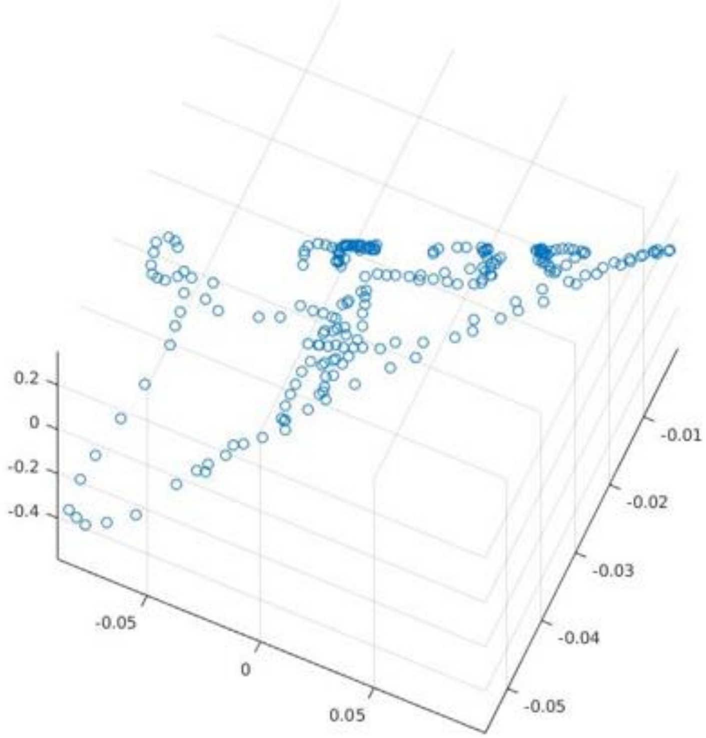

Figure 9: Kirk 3D-model View2

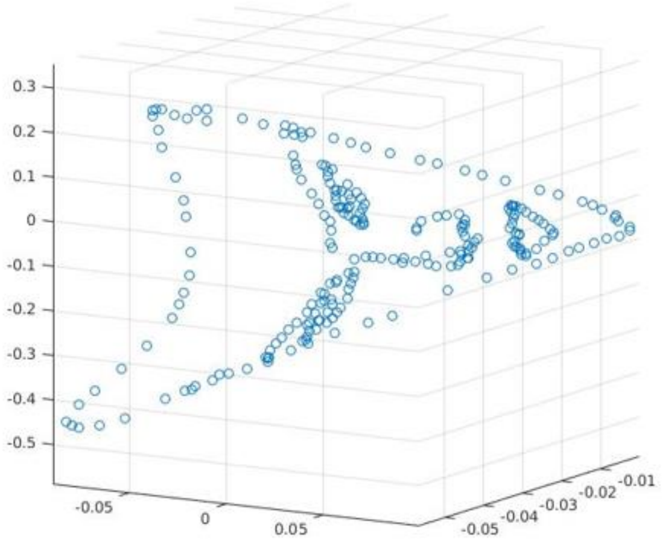

Figure 10: Kirk 3D-model View3

Tpol Image Example

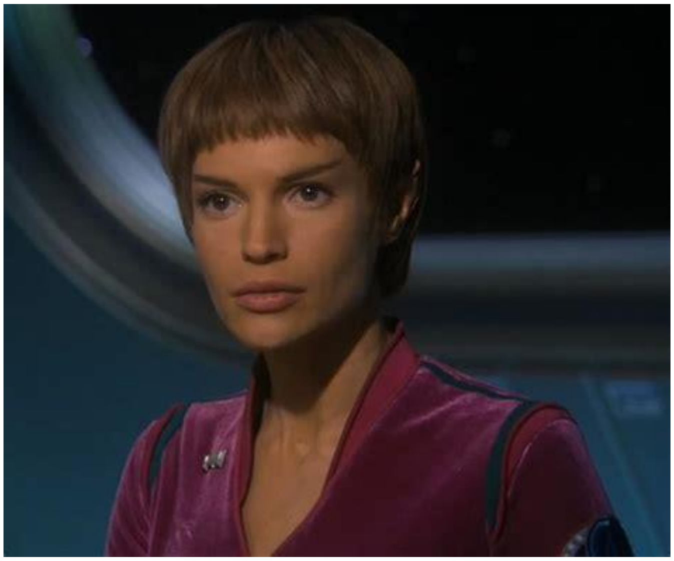

Figure 11: Tpol Input Image

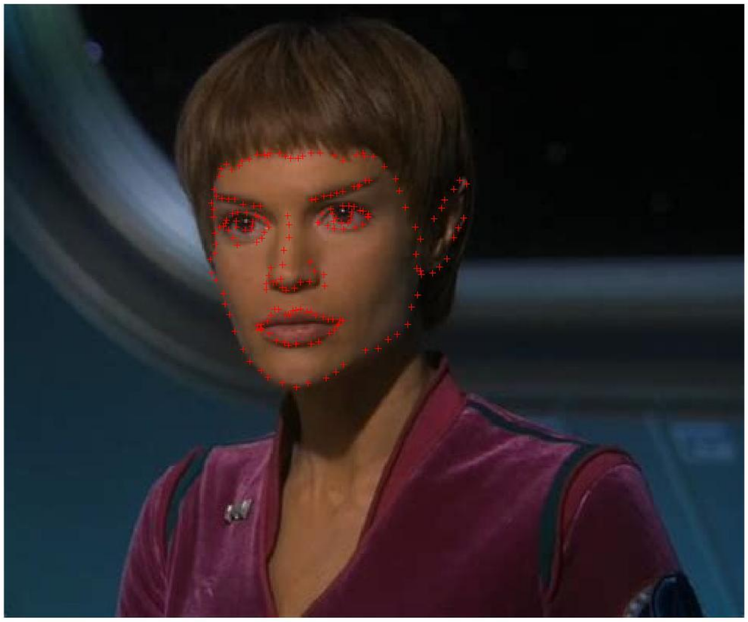

Figure 12: Tpol Feature Points

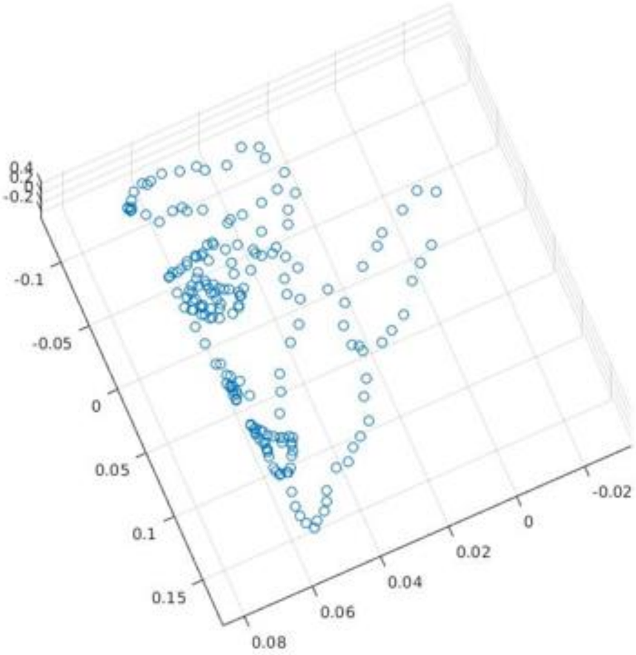

Figure 13: Tpol 3D-model View1

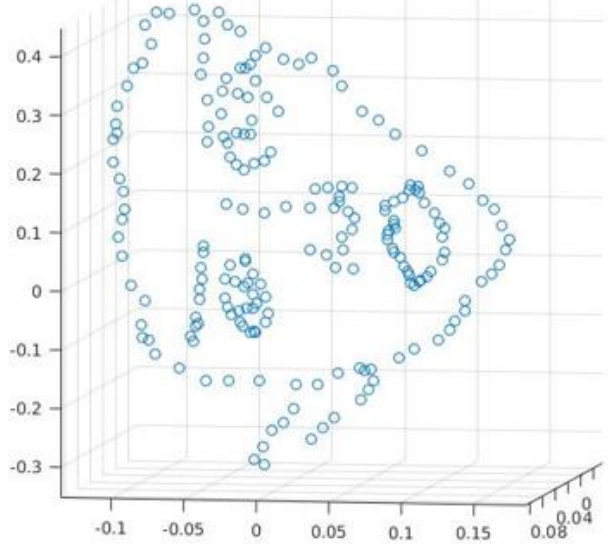

Figure 14: Tpol 3D-model View2

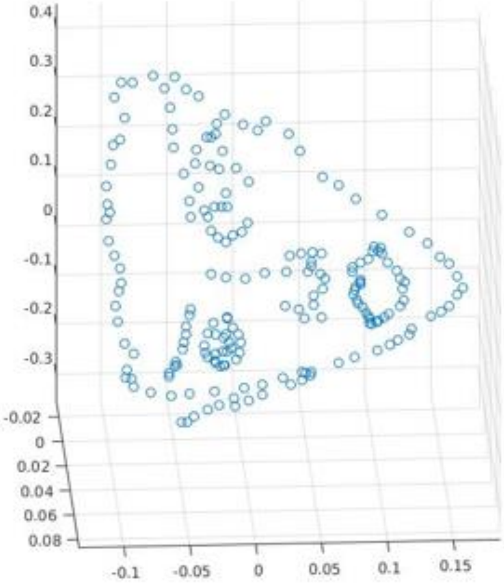

Figure 15: Tpol 3D-model View3

Stark Image Example

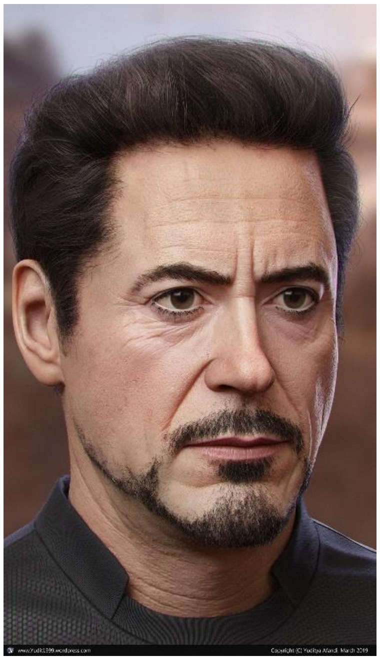
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Figure 16: Stark Input Image

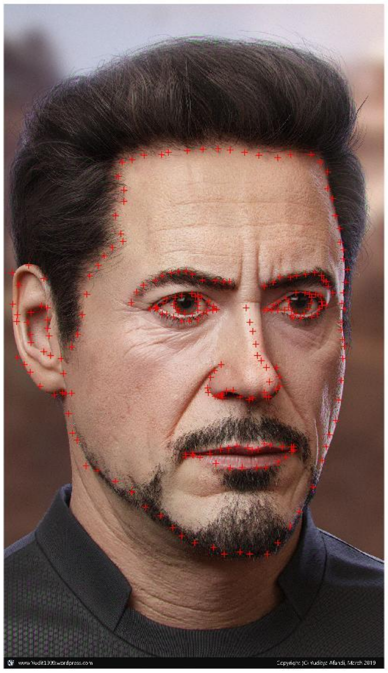
www.Yudit1999.wordpress.com
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Figure 17: Stark Feature Points

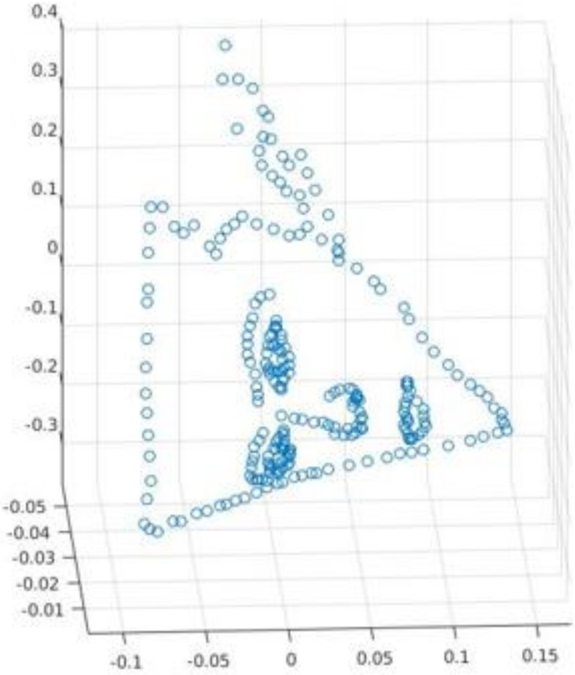

Figure 18: Stark 3D-model View1

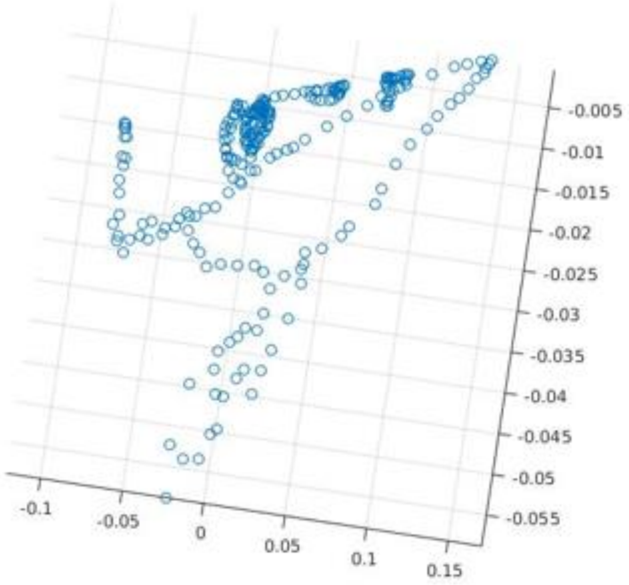

Figure 19: Stark 3D-model View2

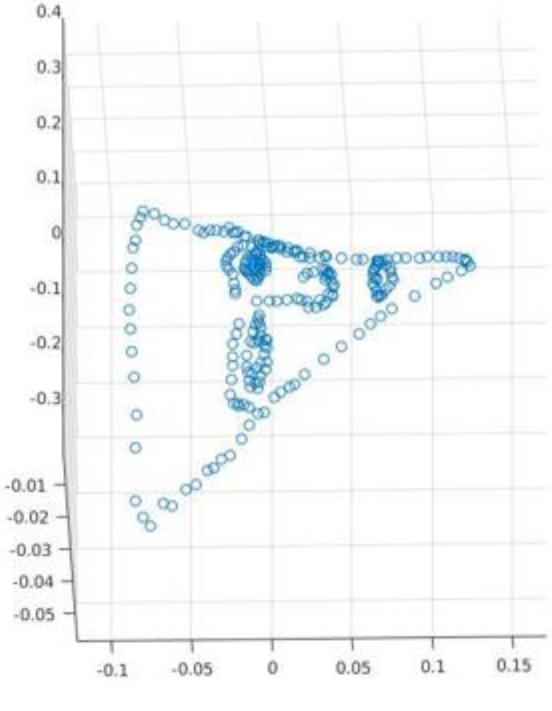

Figure 20: Stark 3D-model View3

Conclusion:

As it can be seen in the examples in the previous section, all input images yield realistic 3d models when stereoscopic imaging is used. This goes on to show that stereoscopic imaging is a very useful tool since only one 2d-image can be enough to create realistic 3d facial models.