VISUALIZATION TECHNIQUES FOR 3D FACIAL COMPARISON

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Motivation

Facial analysis is used in many areas:

- Criminal identification
- Authorization software
- Anthropological research
- Medicine

Visualization significantly helps with the analysis process.

BUT:

- How to visualize more than one facial surface without facing occlusions or loosing track of data adherence?
- How to encode the measurements and visualize them to best convey their meaning?
- How to easily identify correlations between data?

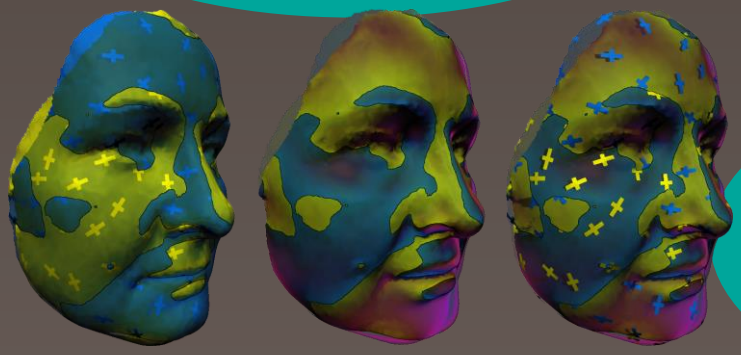

Figure 1 : Example of surface superimposition-based visualizations.

Surface Superimposition

Visualization technique based on overlaying facial models which serves for comparison of two models. Using custom rendering pipeline, this technique employs several visual enhancements to improve the understandability of the image:

- Transparency
- Intersection contours
- Shadow casting curvature glyphs
- Fog simulations

Cross-sectional slices

This method visualizes the local shape and variability of datasets consisting of up to 30 models. It is based on the cross-sectional slices. This technique transfers the local data from 3D to 2D view, which reduces the visual complexity and allows the observer to focus on important features of the dataset, such as alignment of models, local shape differences, or detection of artifacts which occur during data acquisition.

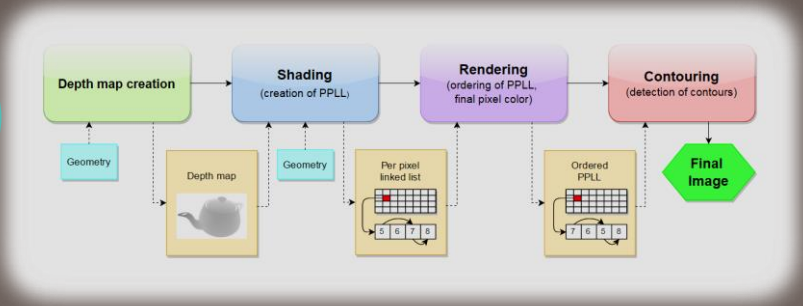

Figure 2: Rendering pipeline used for surface superimposition-based visualization techniques.

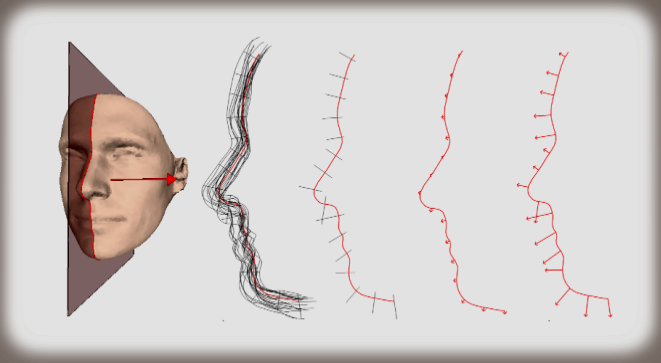

Figure 3: Visualization of local variability based on cross-sectional slices.

Plots

This method employs heat maps to visualize the extensive table-like numerical data representing measurements in very large datasets. The purpose of this tool is to reduce the need for further data post-processing using other applications and to provide yet another view on the data.

Results

To evaluate the visualization techniques a user study was conducted among four scientists working in the area of facial analysis. The results revealed that the scientists found the presented visualization techniques contributory to many areas of their workflow, such as model alignment, shape analysis, or variability analysis.

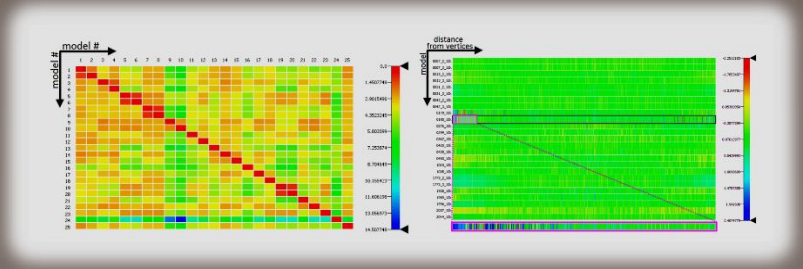

Figure 4: Heatplot visualization of numerical results.