

# A Morphable Model for the Synthesis of 3D Faces

Volker Blanz & Thomas Vetter

[http://www.youtube.com/watch?v=nice6NYb\\_WA](http://www.youtube.com/watch?v=nice6NYb_WA)

## **Basic algorithm**

(00:00): A morphable face model is derived from a dataset of 200 colored 3D scans of faces. Individual faces are combined into a single morphable model by computing dense point to point correspondences to a reference face. A modified optic flow algorithm establishes 3D correspondences automatically. The morphable model combines 3D shape and texture information of all example faces into one vector space of faces. We can form arbitrary linear combinations of the examples and generate continuous transitions.

## **Application to face editing**

(00:54): Starting from the average face, individual original faces are caricatured by increase the distance from the average. Forming the average from male and female faces separately, the difference can be added to or subtracted from individual face to change the perceived gender. Other facial attributes such as the fullness of the face can be manipulated in a similar way. From a labeled set of faces, the characteristic changes are extracted automatically. In our model, they are controlled by a single parameter. Differences in facial expressions captured from another face can be mapped to any individual.

## **Application to 3D reconstruction (Tom Hanks)**

(02:03):

## **More applications (Audrey Hepburn and Monna Lisa)**

(03:50): From this image, we also estimate 3D shape and texture and combined the photograph with 3D computer graphics. Cast shadows of novel objects are rendered correctly into the scene. Illumination conditions can be changes and pose can be varied to some extent. From a single black and white image, we've obtained a full estimate of 3D shape. The result of the matching procedure includes an estimate of the surface color since the morphable model contains color information. Finally, we show the application of our model to a painting.