HIERARCHICAL SPLINE IN THE REPRESENTATION OF A MODEL WITH AN EXTREMELY ROUGH SURFACE

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CED-2024

Parameterization of complex cultural heritage shapes

It is about reducing the data-set size. A smooth approximation of the surface is presented by the parametric model. The differences between the original 3D surface and the obtained parametric model are stored as an image. The advantages of such a form is a very small number of parameters needed to display the shape. Putting them together, we almost get the start 3D surface – numerical approximation.

a) *Original scanned 3D point cloud*

b) *B-Spline model fitted to a)*

c) *The difference of a) and b) in normal direction*

a)

b)

(mm)
3.211
2.343
1.476
0.608
-0.260
-1.128
-1.995
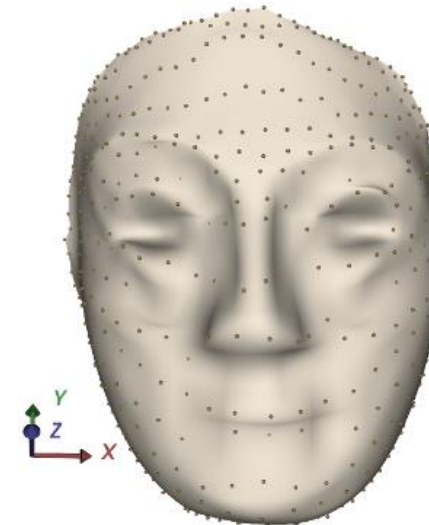
c)

Displacement surface model

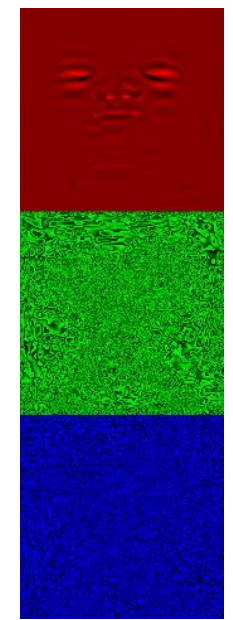The approximation of the displacement scalar field by the 24-bit bitmap.

a) *The displacement field*

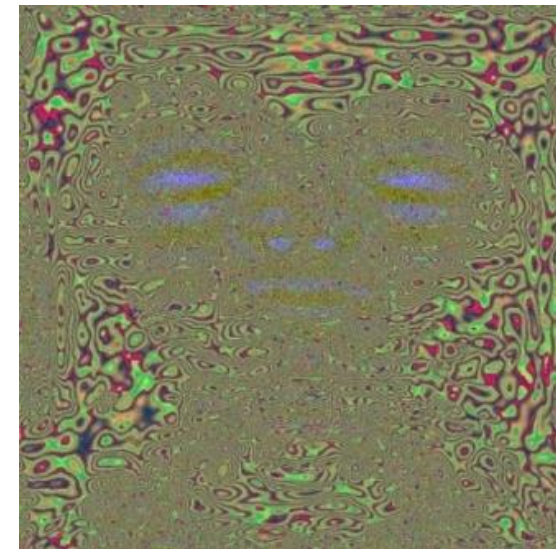b) *The approximation of a) by three channel of 24-bit bitmap*

c) *The merged three channel from b)*

a)

b)

c)

The proposed displacement surface model

The first column shows a parametric model.

The middle column shows the displacement field as a 24-bit image.

The third column shows a final displacement model.

The parametric model of the face is a B-spline with a grid of 25×25 control points, while the parametric model of the hair is a B-spline with a grid of 48×48 control points.
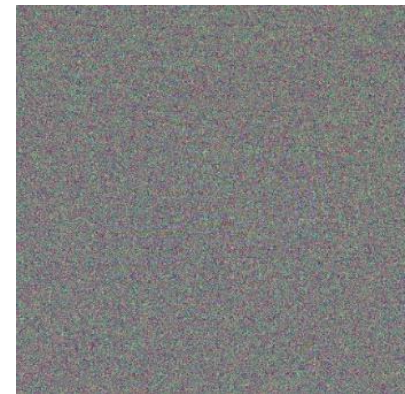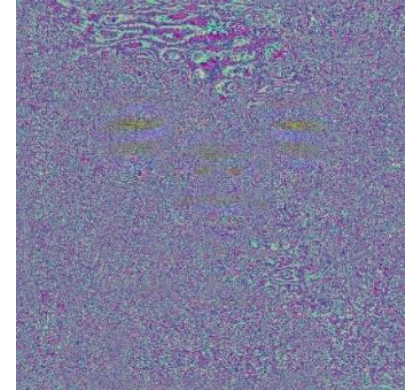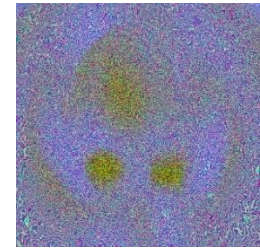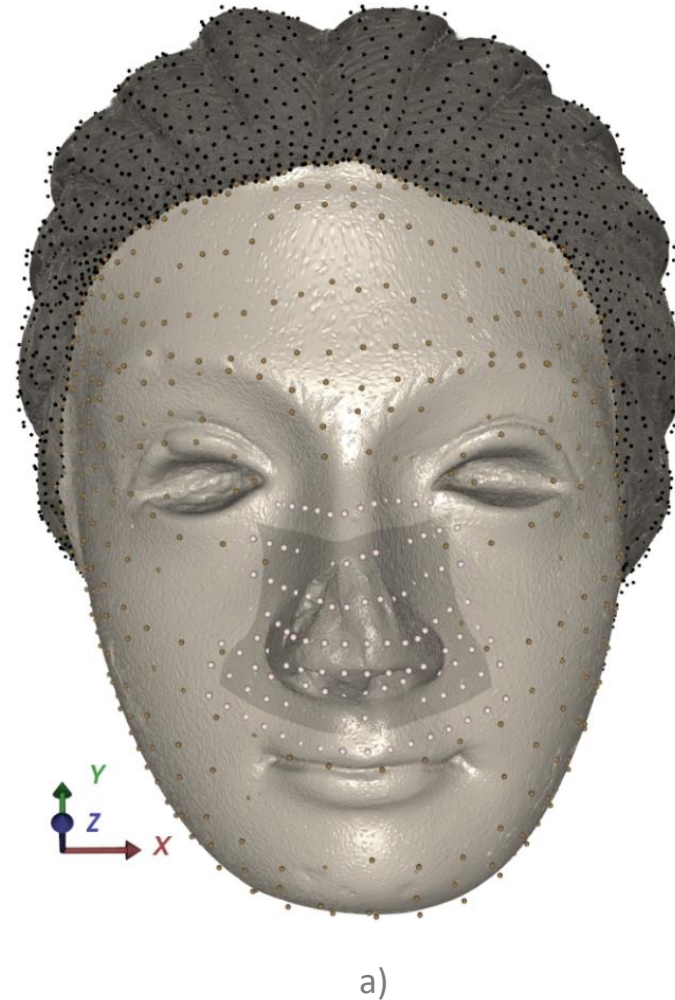

a)   +   b)   =   c)

d)   +   e)   =   f)
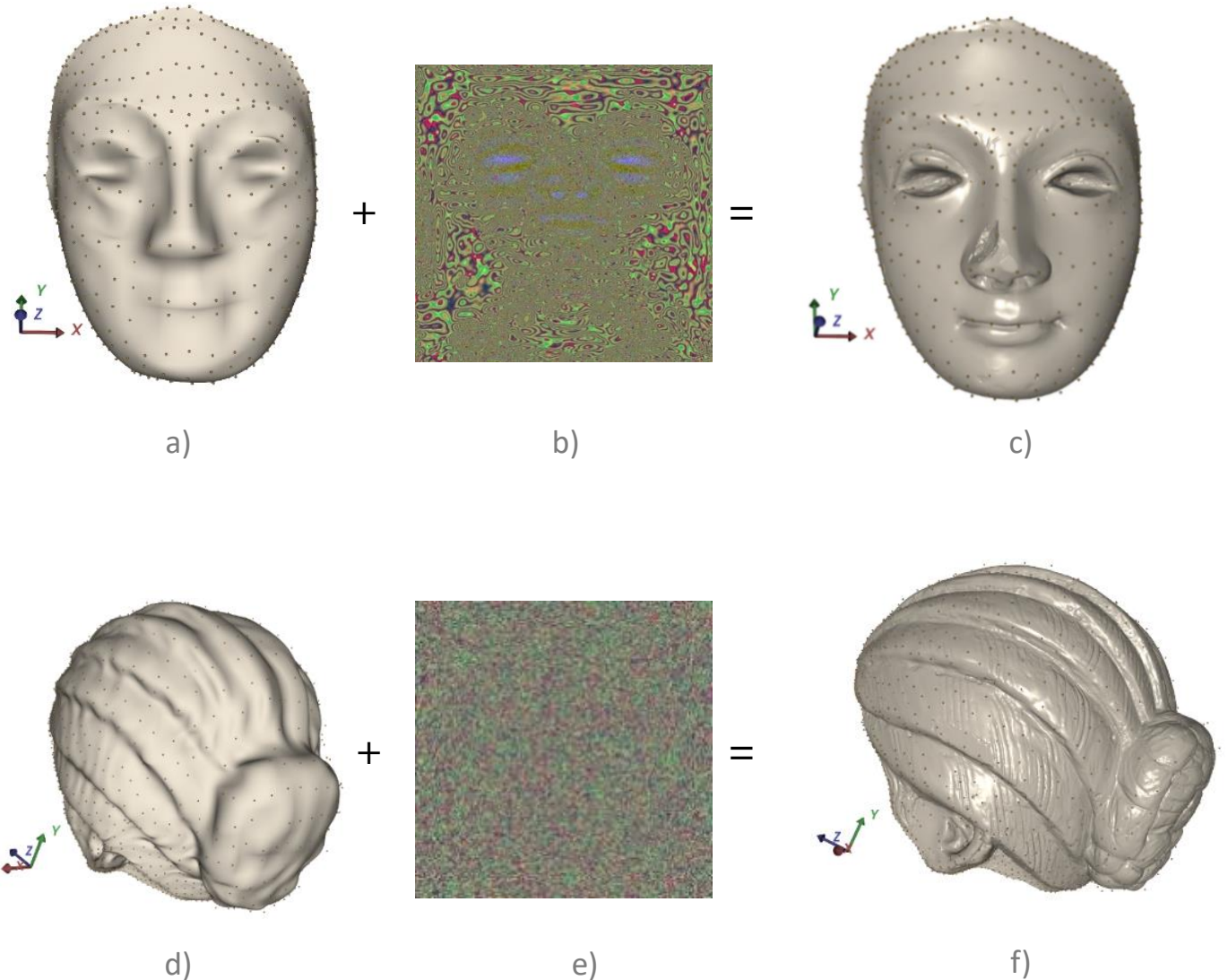
Surface damage compared to the original model surface

a) local damage with significant geometry changes and additional surface roughening

b) erosion of the entire model surface from a).

a)

b)
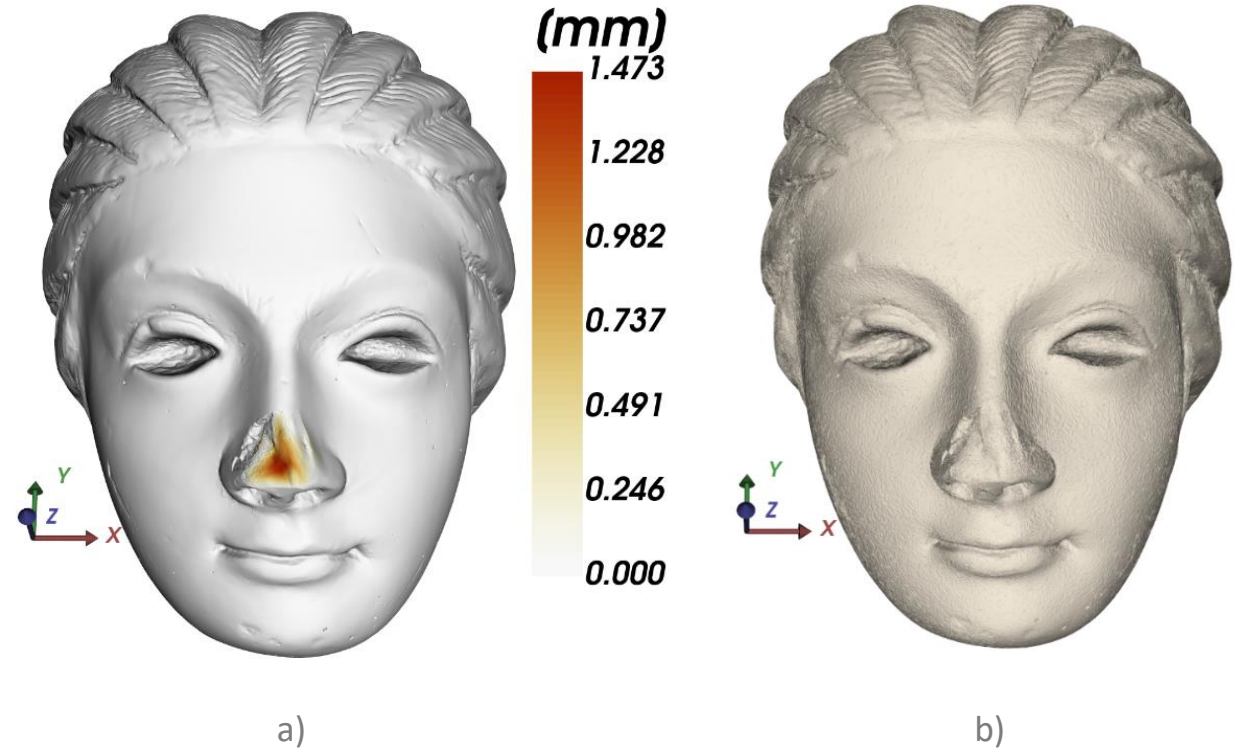
HIERARCHICAL SPLINE

a) displacement surface of a model with an extremely rough surface

b) displacement image related to the nose area with a resolution of 500×500 pixels

c) displacement image related to the face with a resolution of 2000×2000 pixels

d) displacement image related to the hair with resolution of 2000×2000 pixels

a)

b)

c)

d)

Thank you!