

A Direct Texture Placement and Editing Interface

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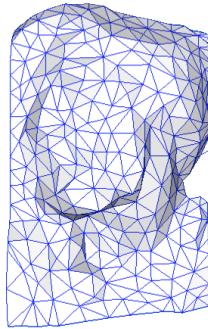
Textures



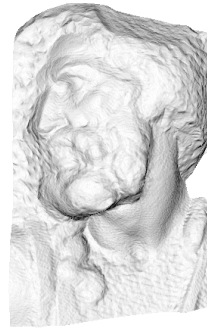
Color Map



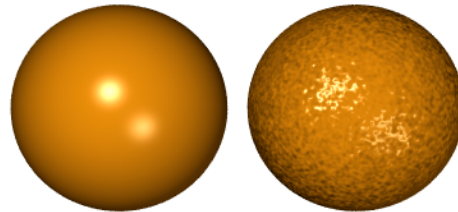
original mesh
4M triangles



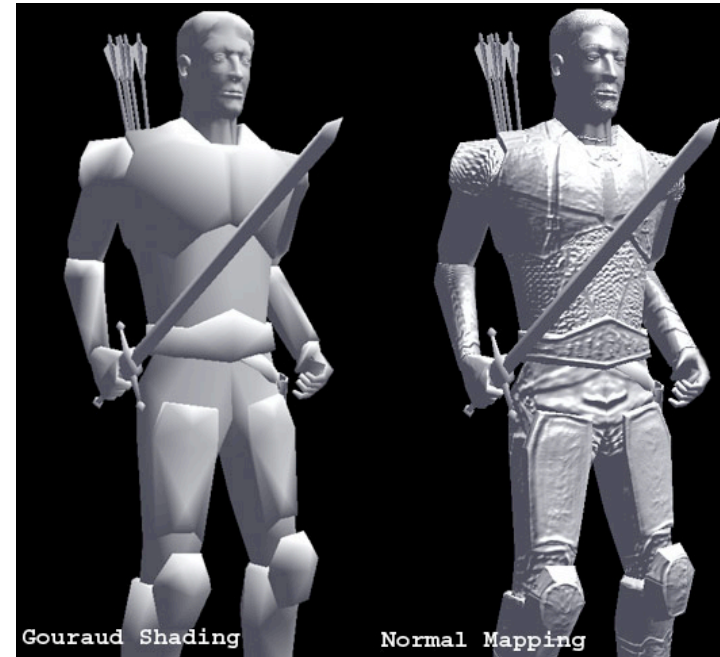
simplified mesh
500 triangles



simplified mesh
and normal mapping
500 triangles

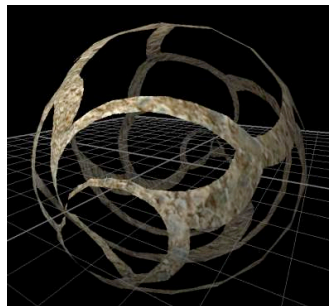


Normal Map

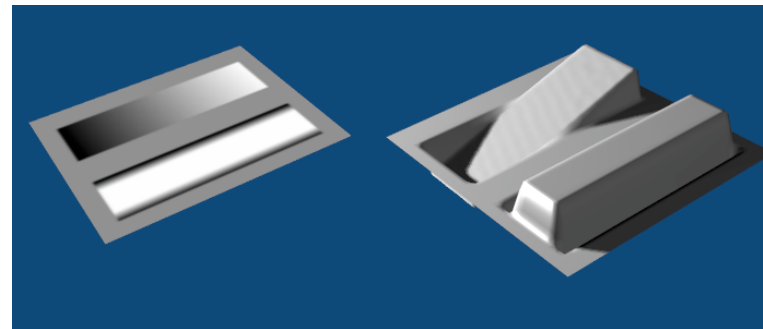


Gouraud Shading

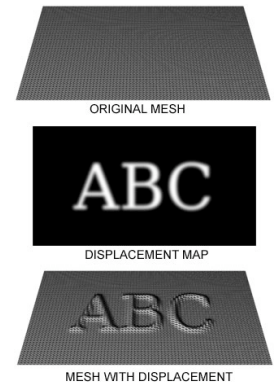
Normal Mapping



Alpha Map



Displacement Map



ORIGINAL MESH

ABC

DISPLACEMENT MAP

ABC

MESH WITH DISPLACEMENT

Overview

2 approaches to texturing

1 technical digression

7 operations

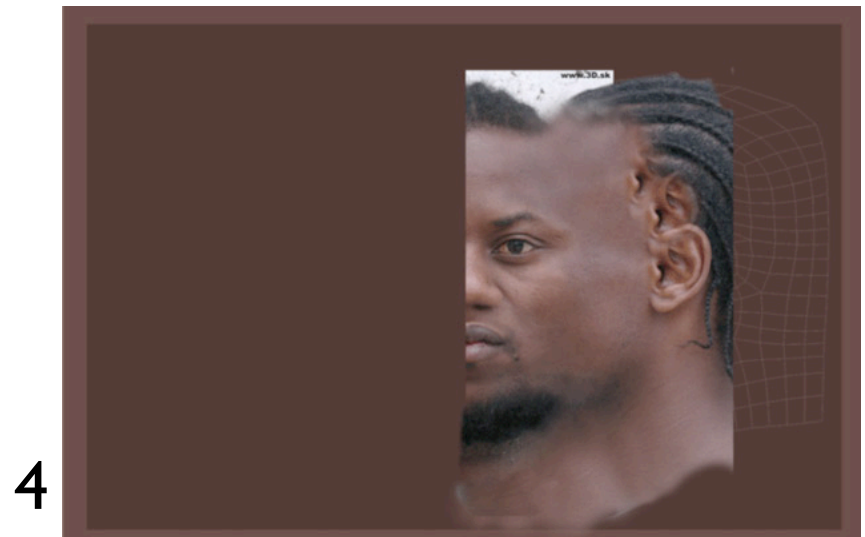
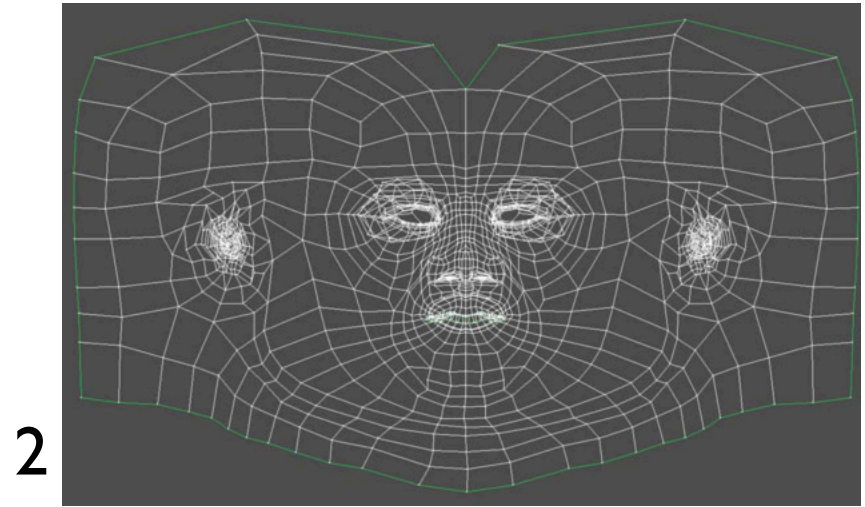
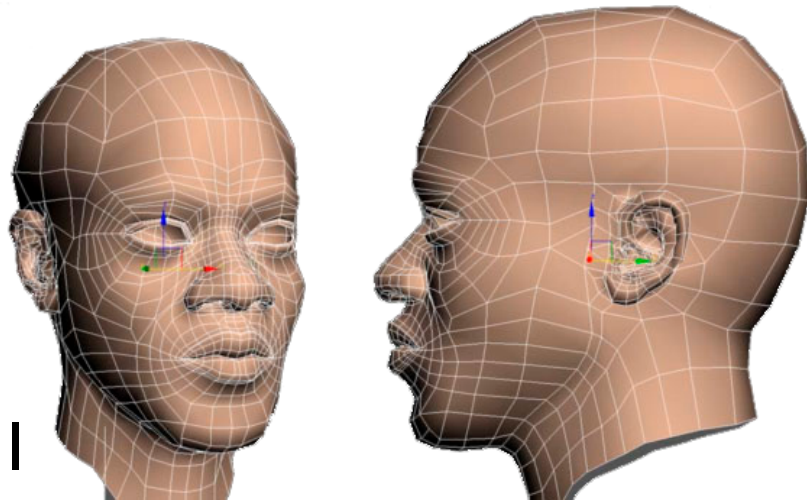
3 formulae

1 technical comparison

First Approach to Texturing

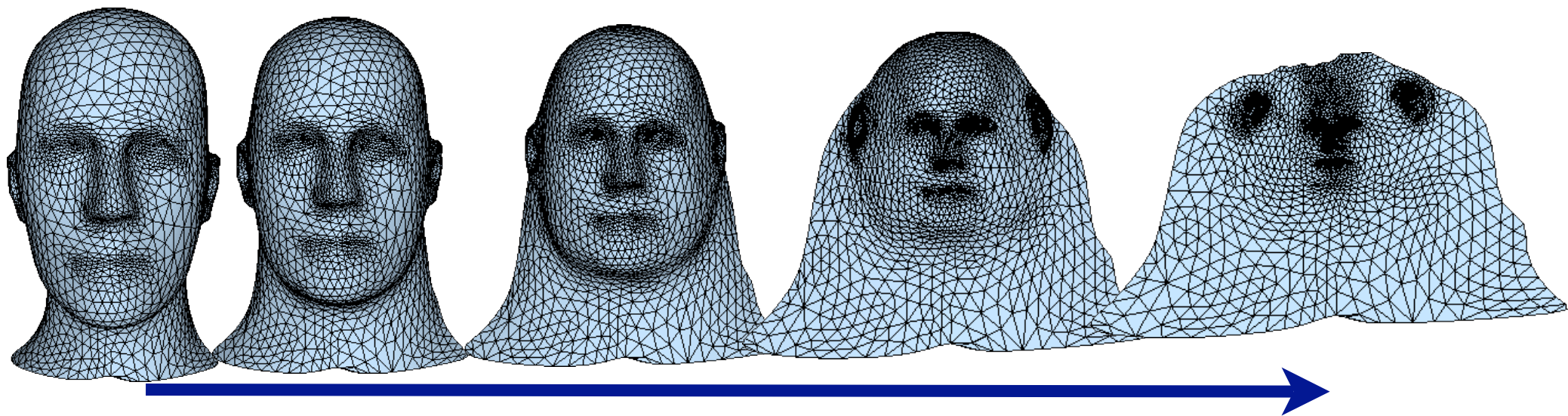
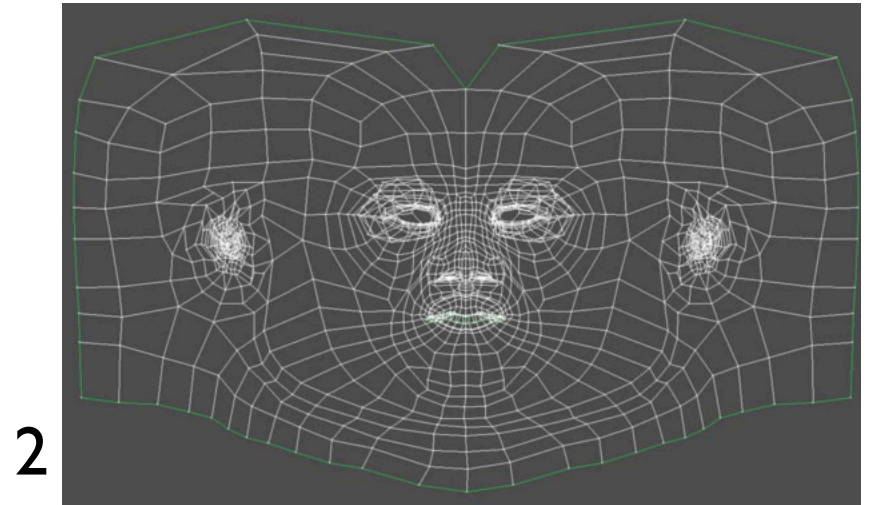
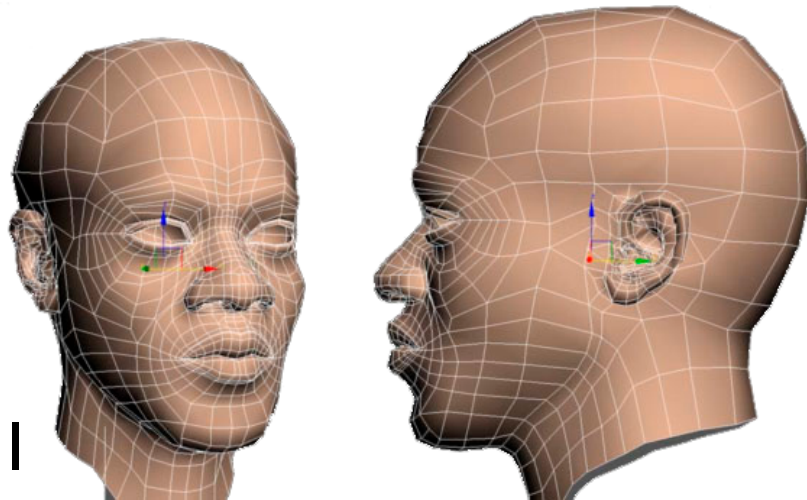
Jiri's Texturing Tutorial

[Jiri Adamec]



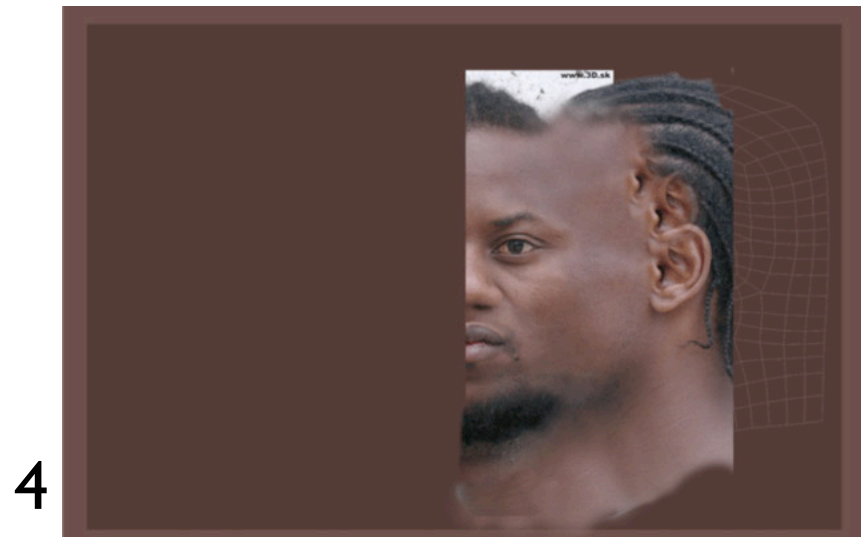
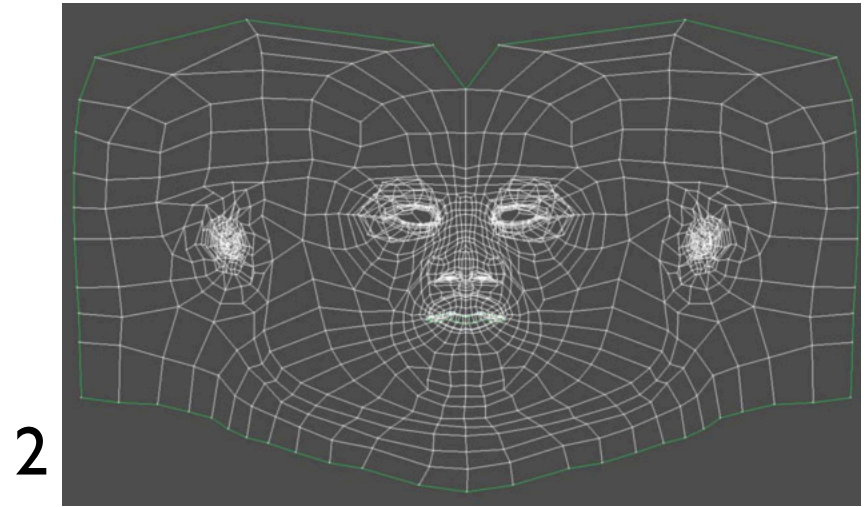
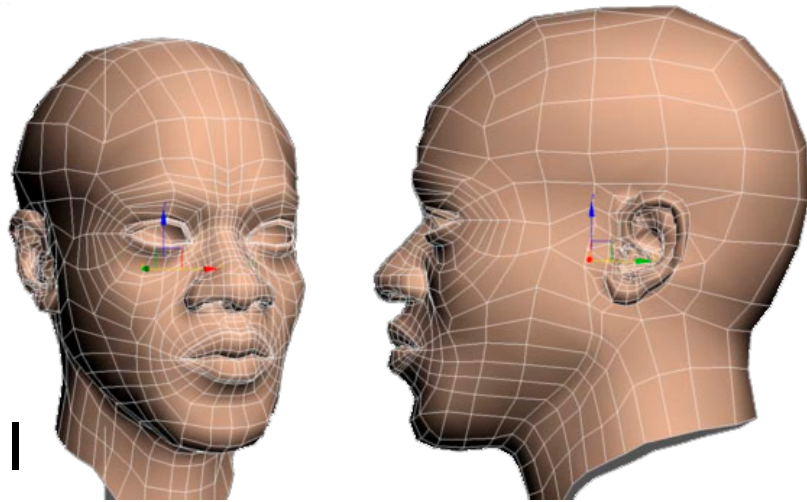
Technical Digression

Flattening



Jiri's Texturing Tutorial

[Jiri Adamec]



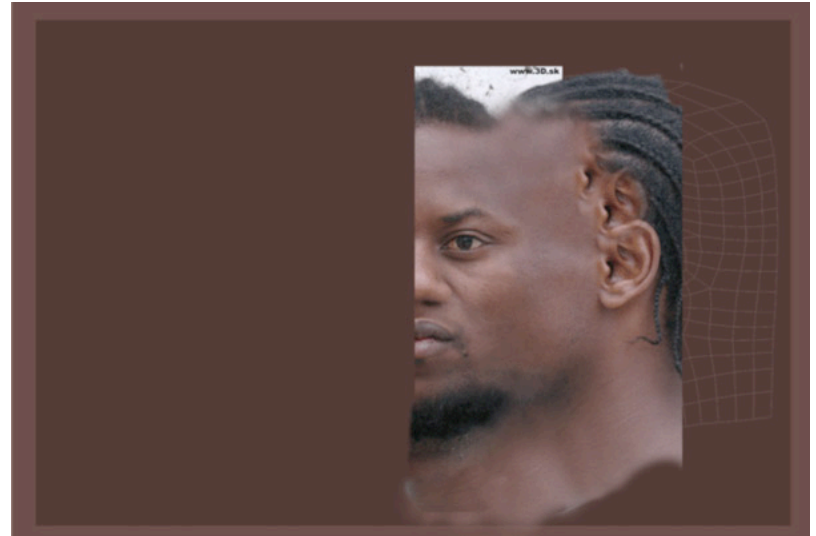
Jiri's Texturing Tutorial

[Jiri Adamec]

3



4



5

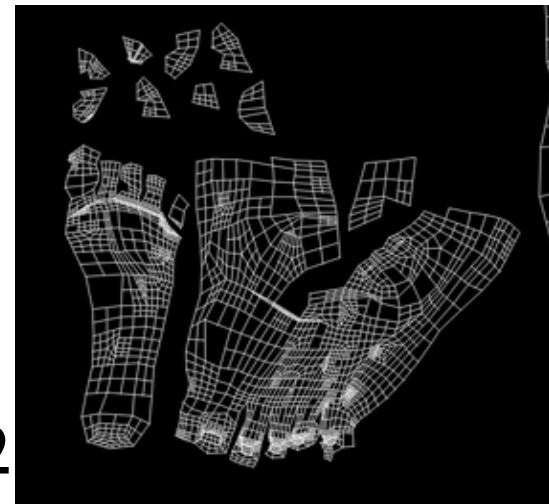
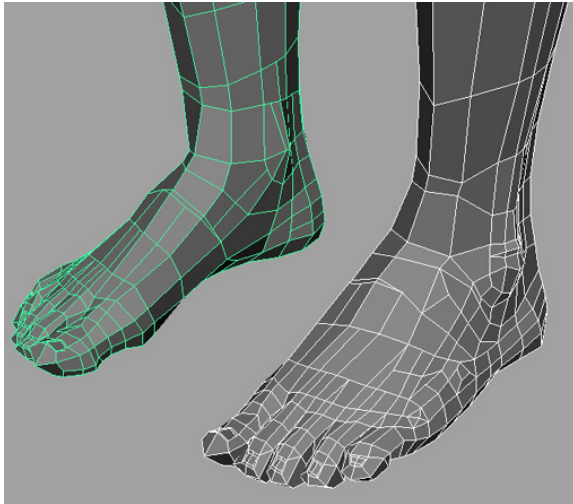


6

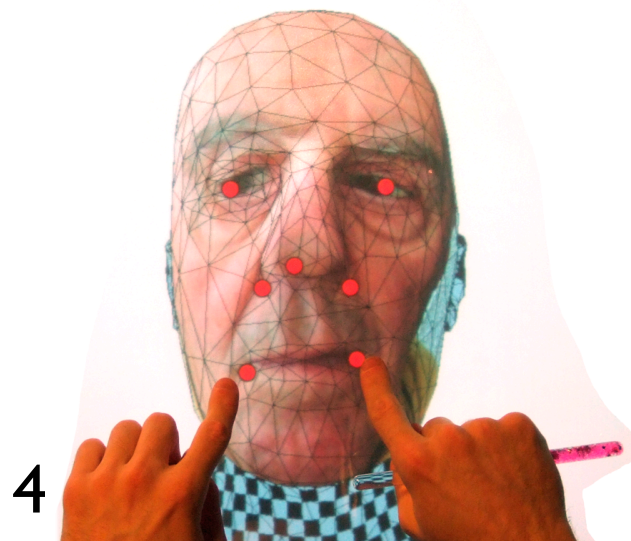
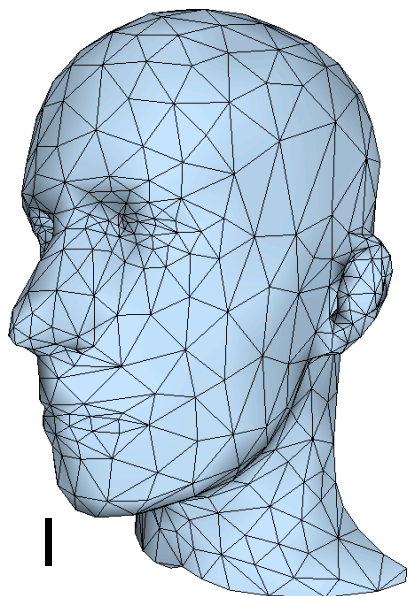


Feet Texturing Tutorial

[Steven Stahlberg]



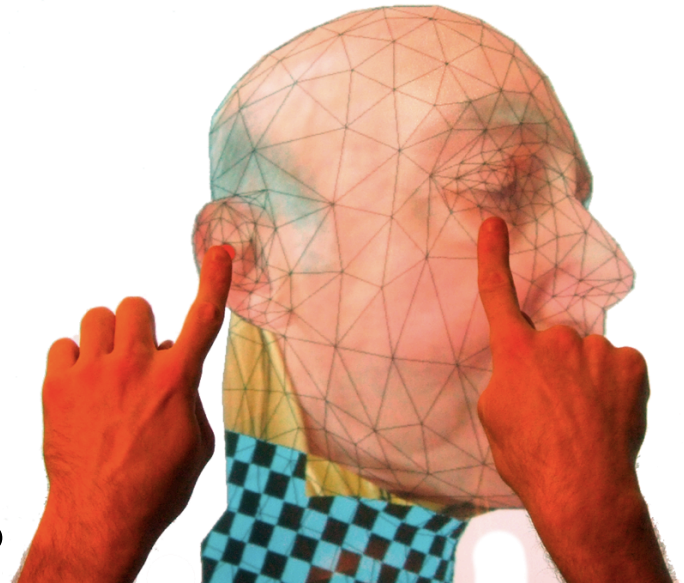
Our Approach to Texturing



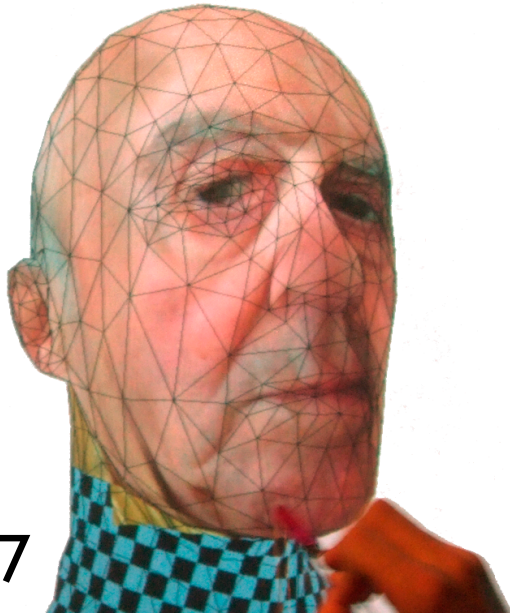
5



6

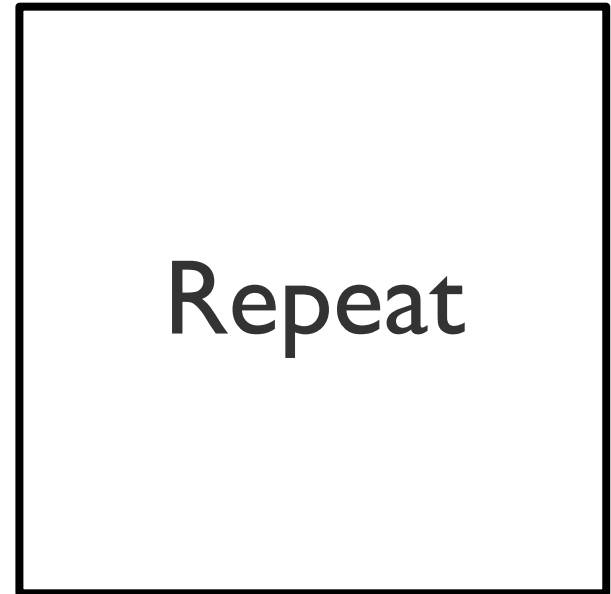


7



Repeat

...



Related Work

2D Image Warping, etc

[Beier and Neely 1992]

[Igarashi et al. 2005]

[Schaefer et al. 2006]

[James and Pai 1999]

3D Texture Painting

[Hanrahan and Haeberli 1990]

[Agrawala et al. 1995]

[Igarashi and Cosgrove 2001]

[Igarashi and Hughes 2002]

[Carr and Hart 2004]

[Schmidt et al. 2006]

2-Handed Manipulation

[Guiard 1987]

[Hinckley et al. 1994]

[Zelevnik et al. 1997]

[Kurtenbach et al. 1997]

[Balakrishnan and Kurtenbach 1999]

[Balakrishnan and Hinckley 2000]

[Llamas et al. 2003]

[Wu and Balakrishnan 2003]

Related Work

Parameterization

[Beier and Neely 1992]

[Maillot et al. 1993]

[Floater 1997]

[Piponi and Borshukov 2000]

[Lévy 2001]

[Sander et al. 2001]

[Sheffer and de Sturler 2001]

[Lévy et al. 2002]

[DeBry et al. 2002]

[Desbrun et al. 2002]

[Kraevoy et al. 2003]

[Yoshizawa et al. 2004]

[Yoshizawa et al. 2005]

[Lee et al. 2005]

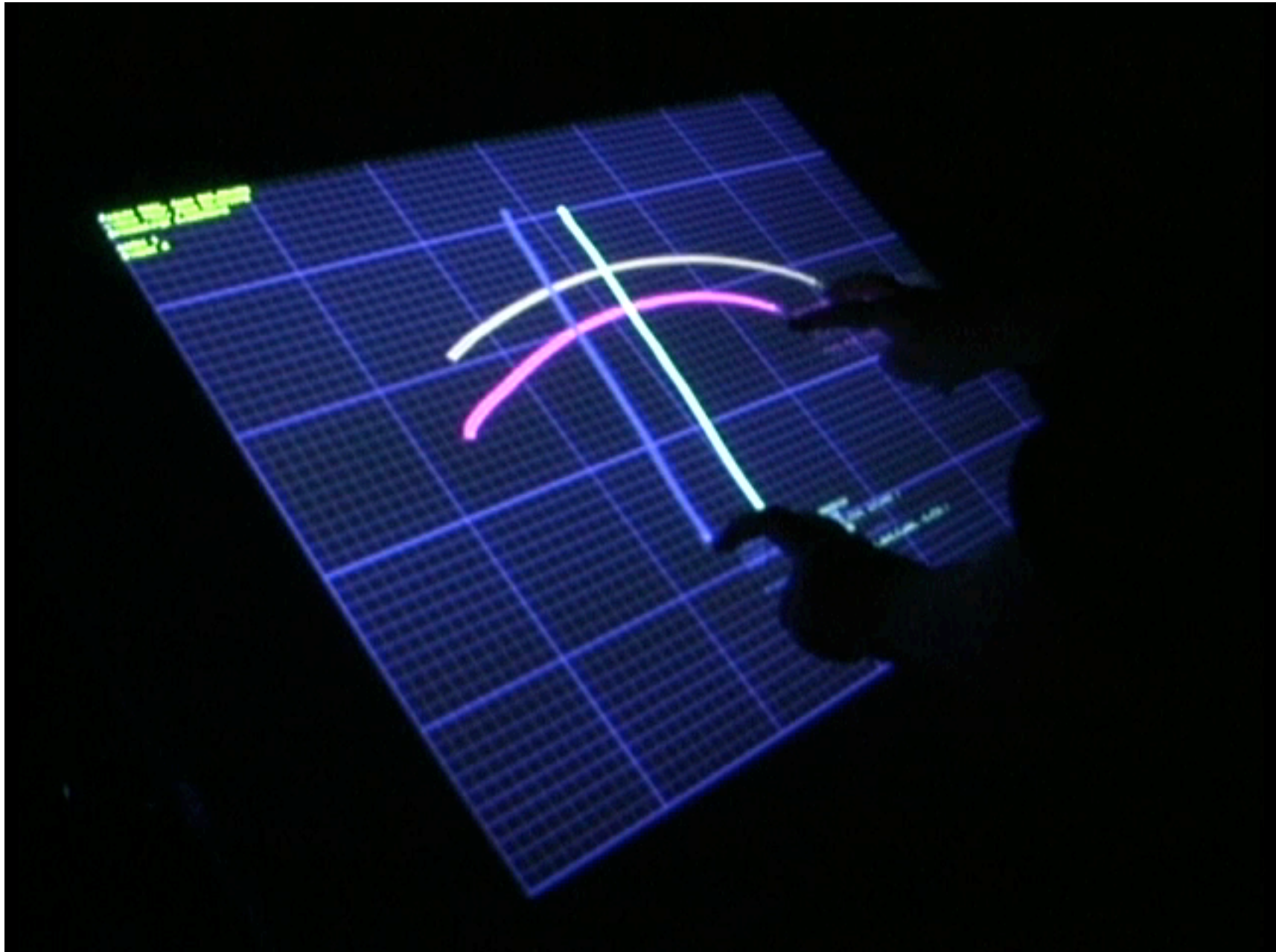
[Sheffer et al. 2005]

[Zayer et al. 2005]

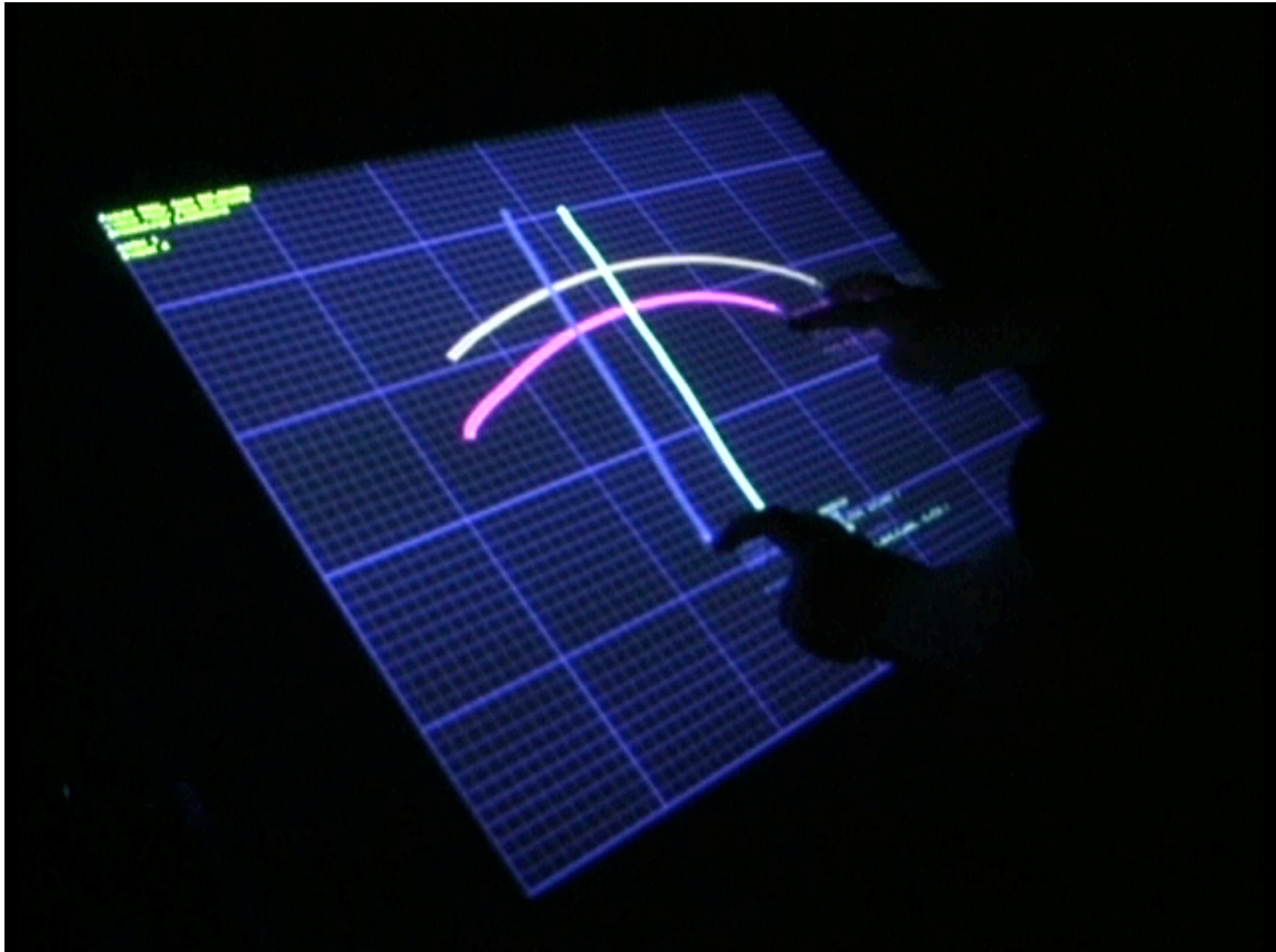
[Yamauchi et al. 2005]

7 Operations

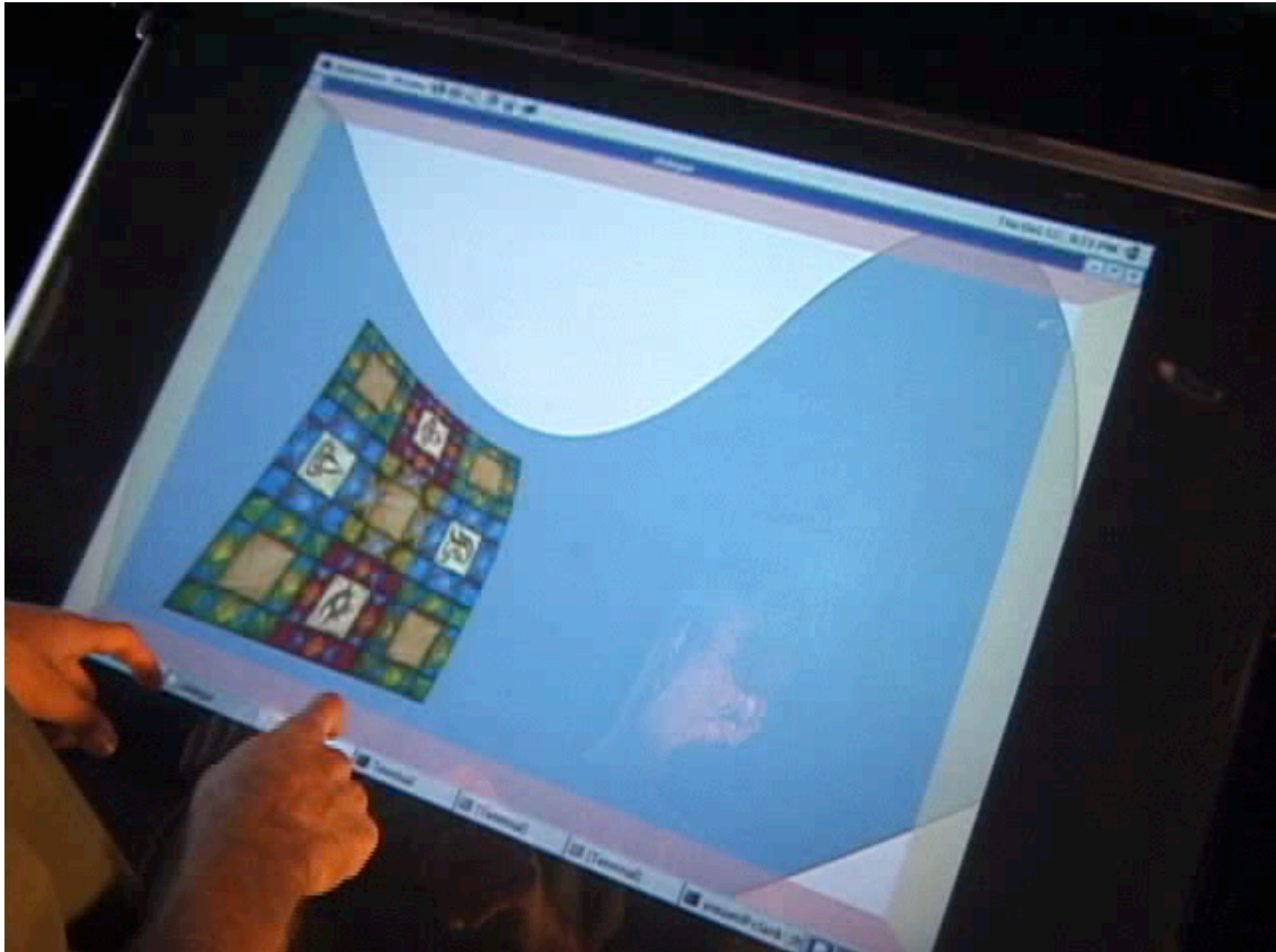
Multi-touch



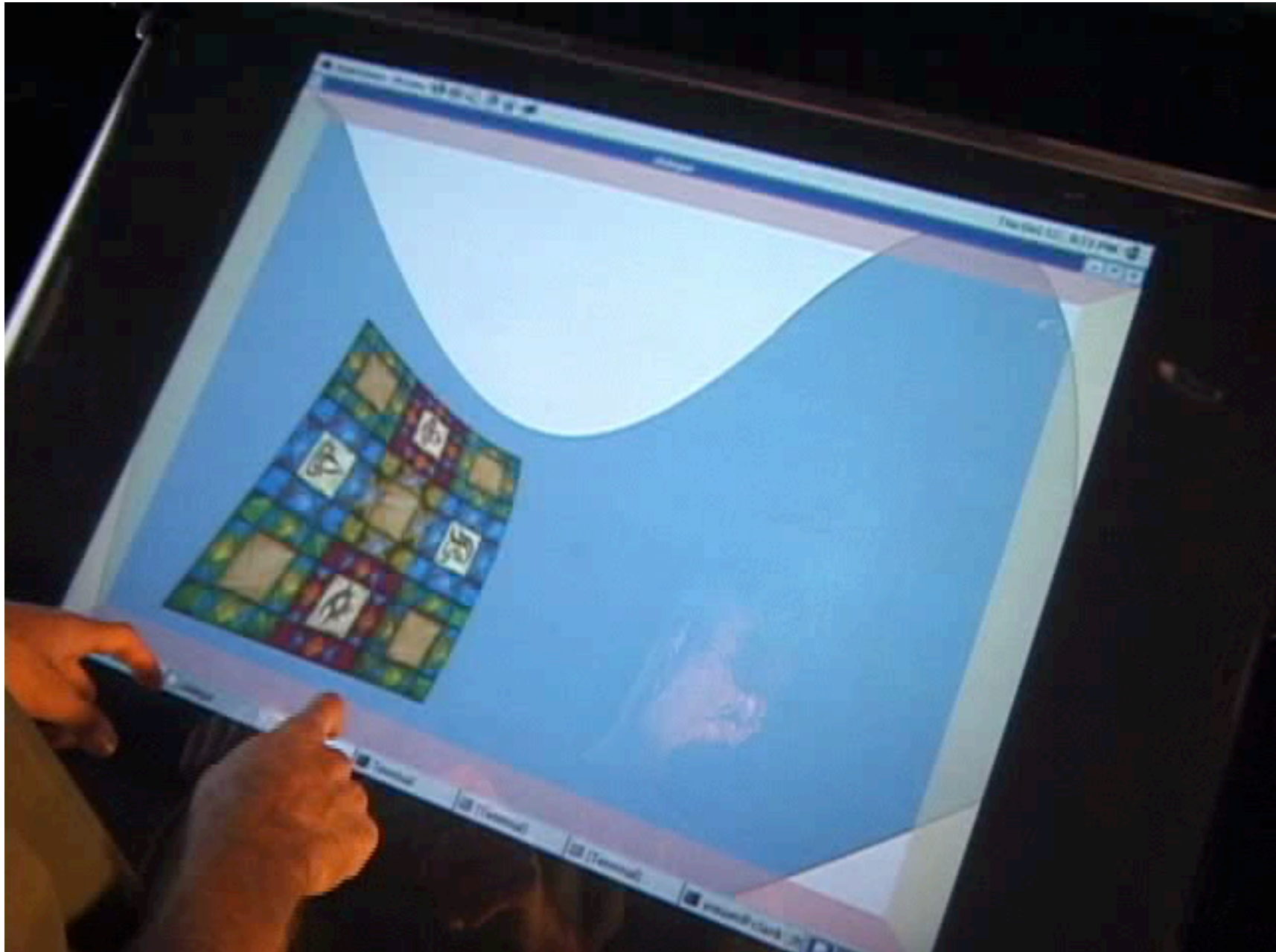
Multi-touch



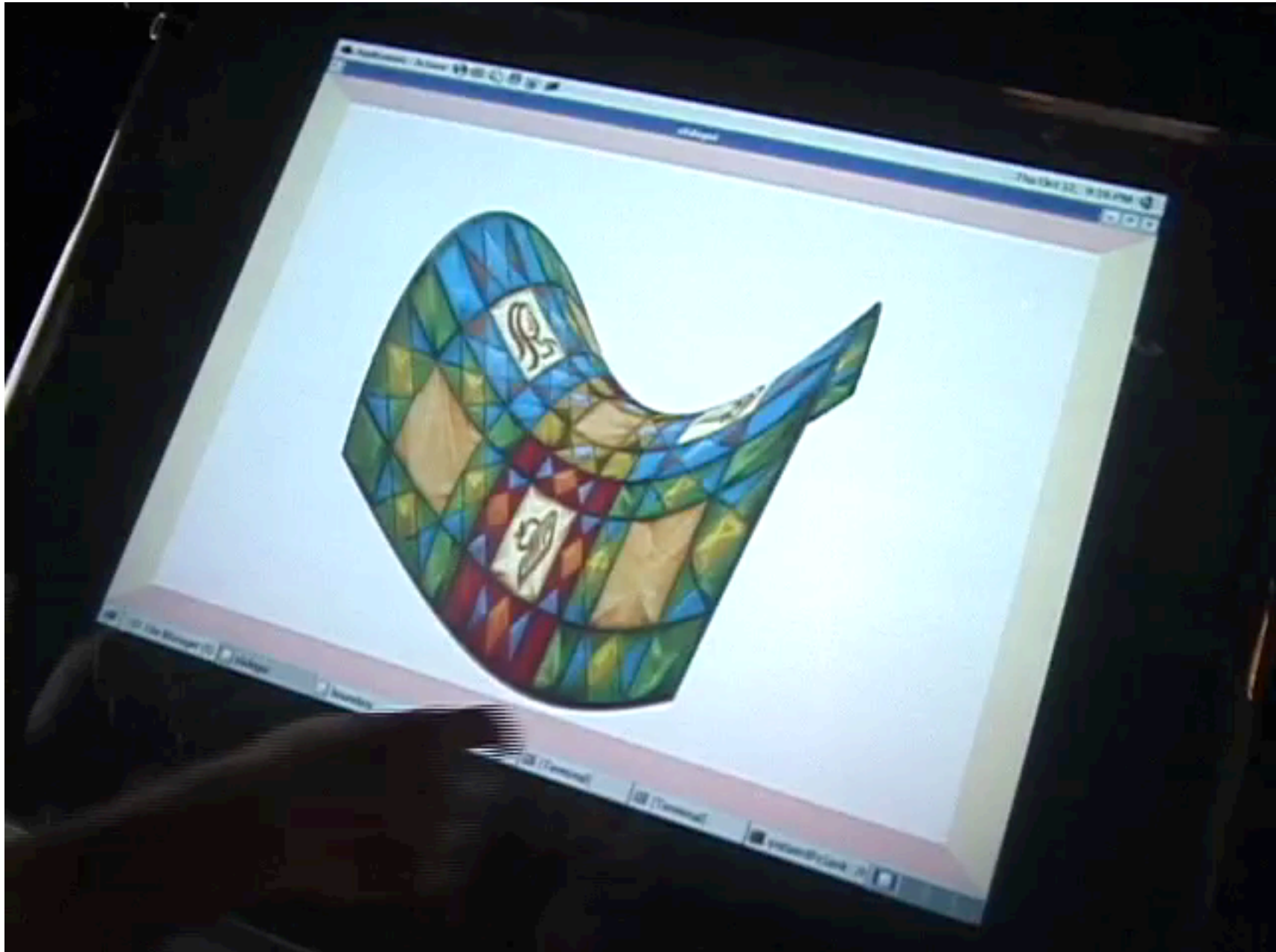
Texture Placement



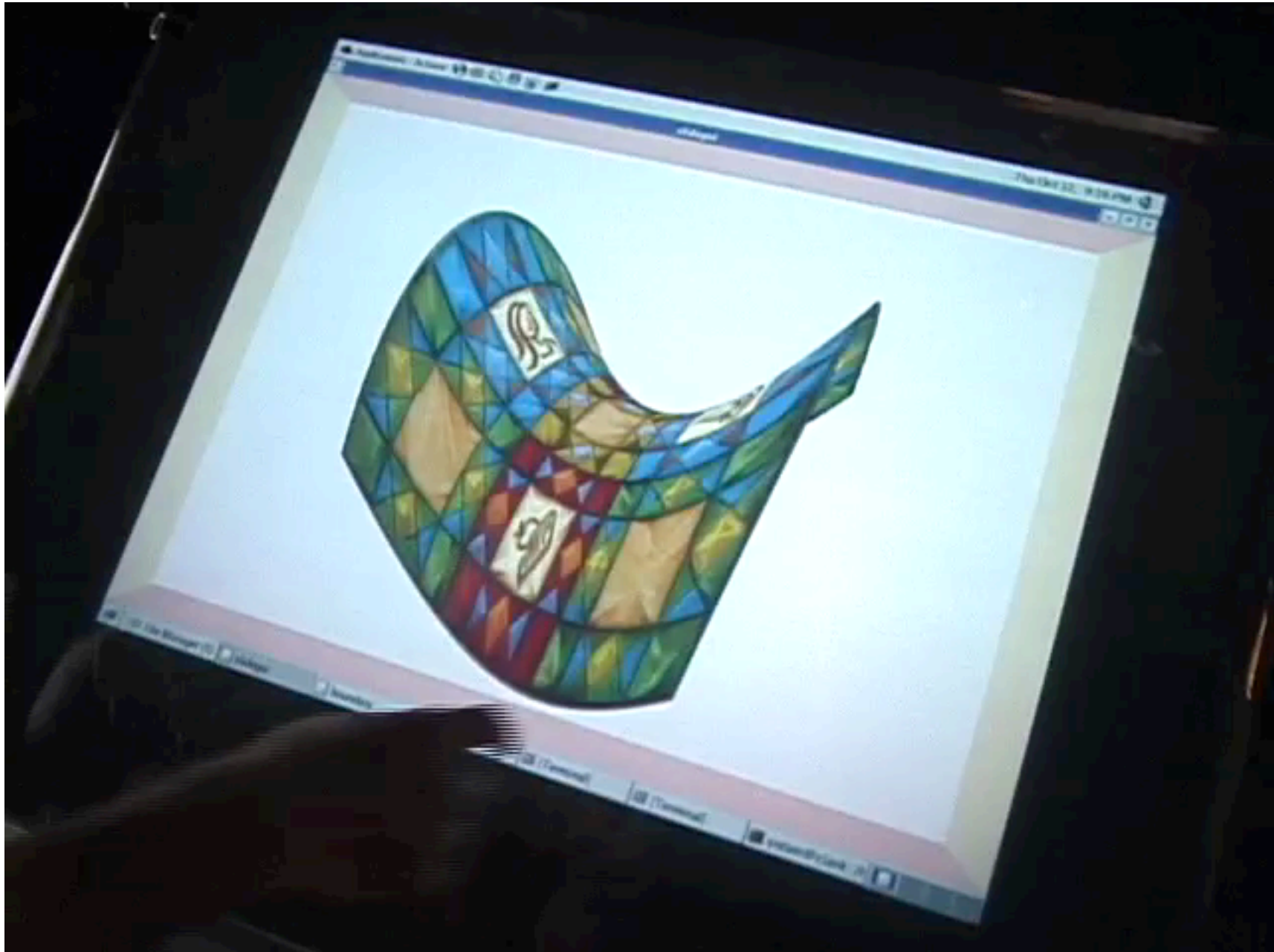
Texture Placement



Feature Alignment



Feature Alignment



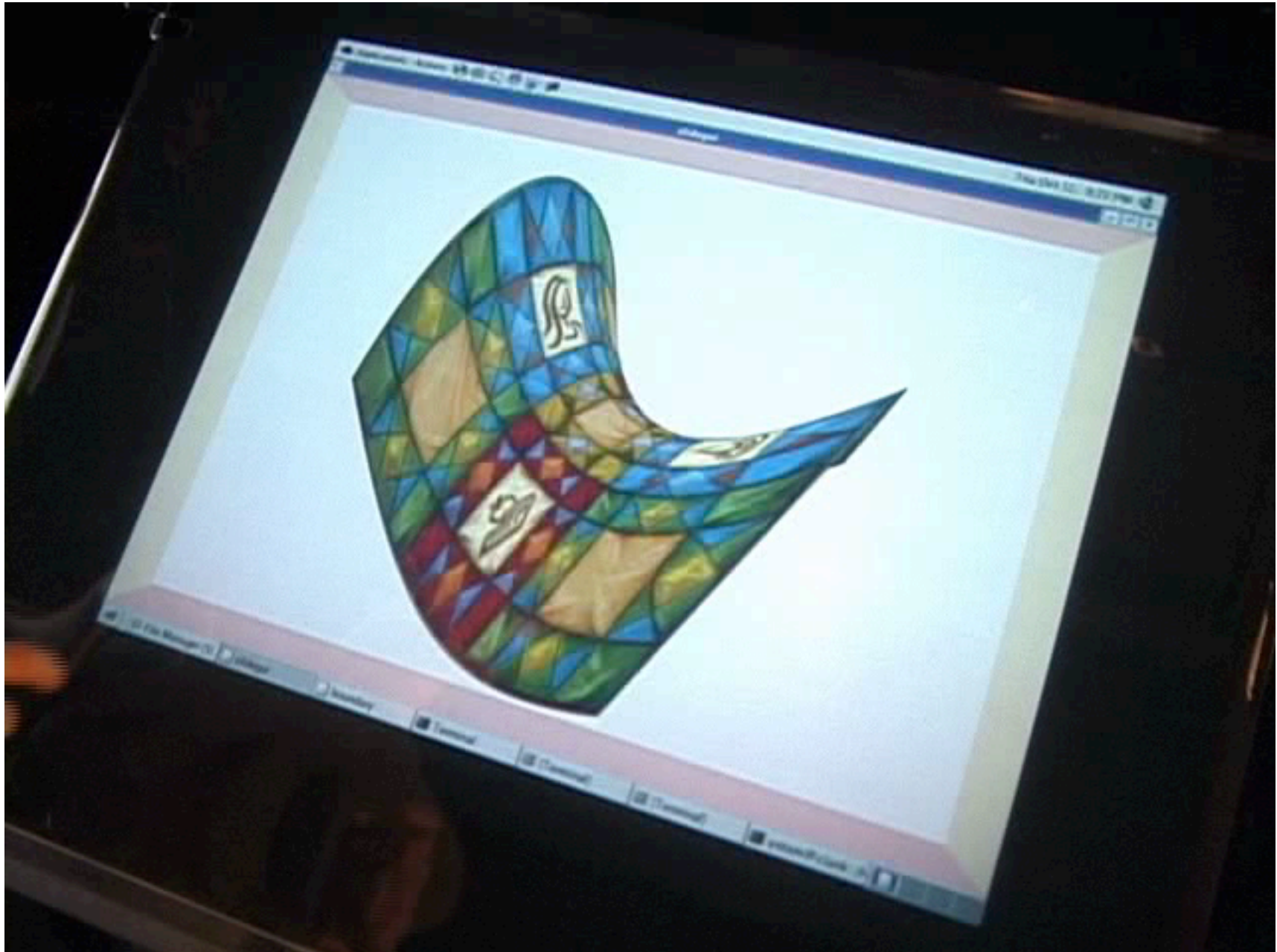
Pushpin Constraints



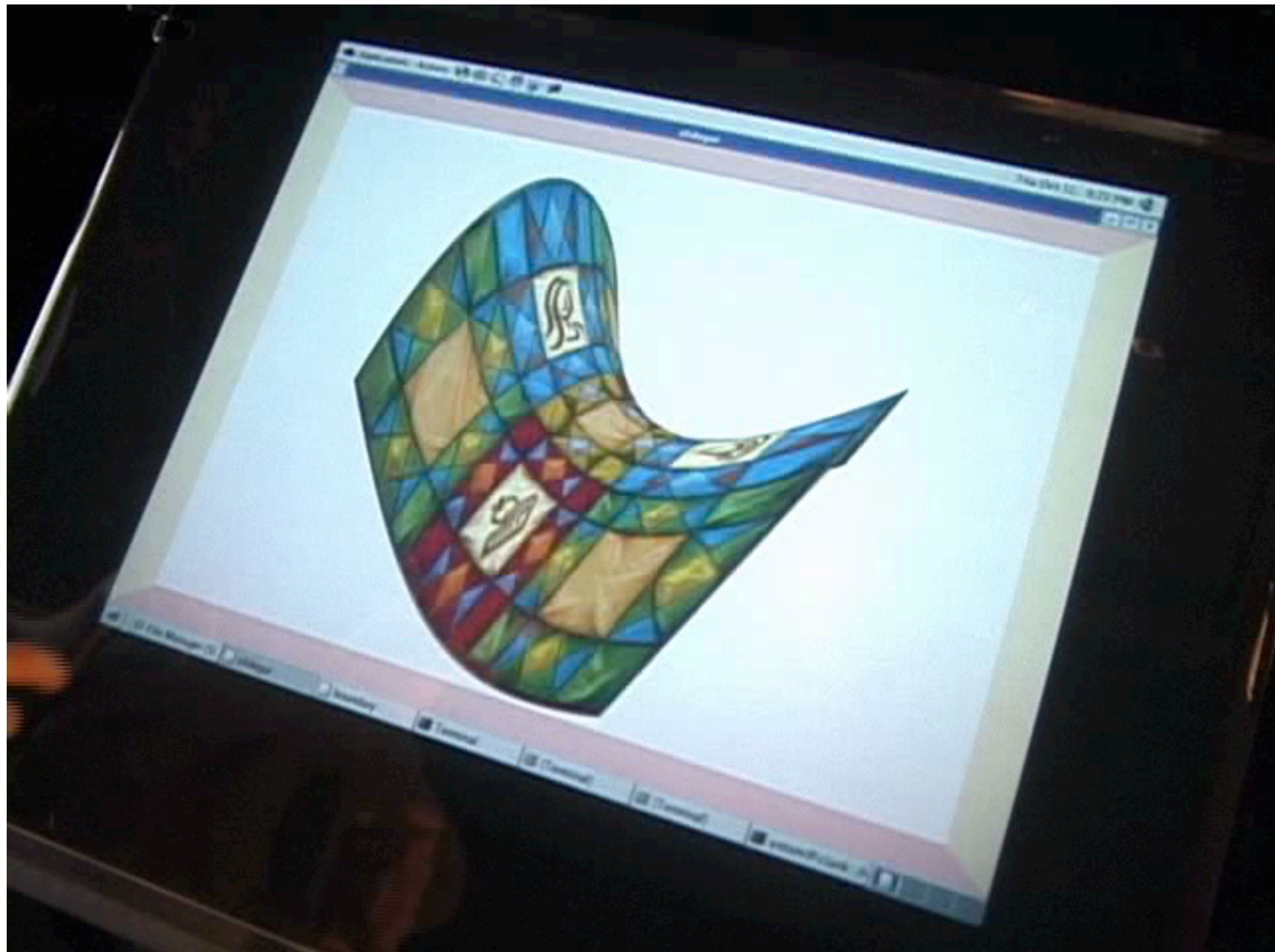
Pushpin Constraints



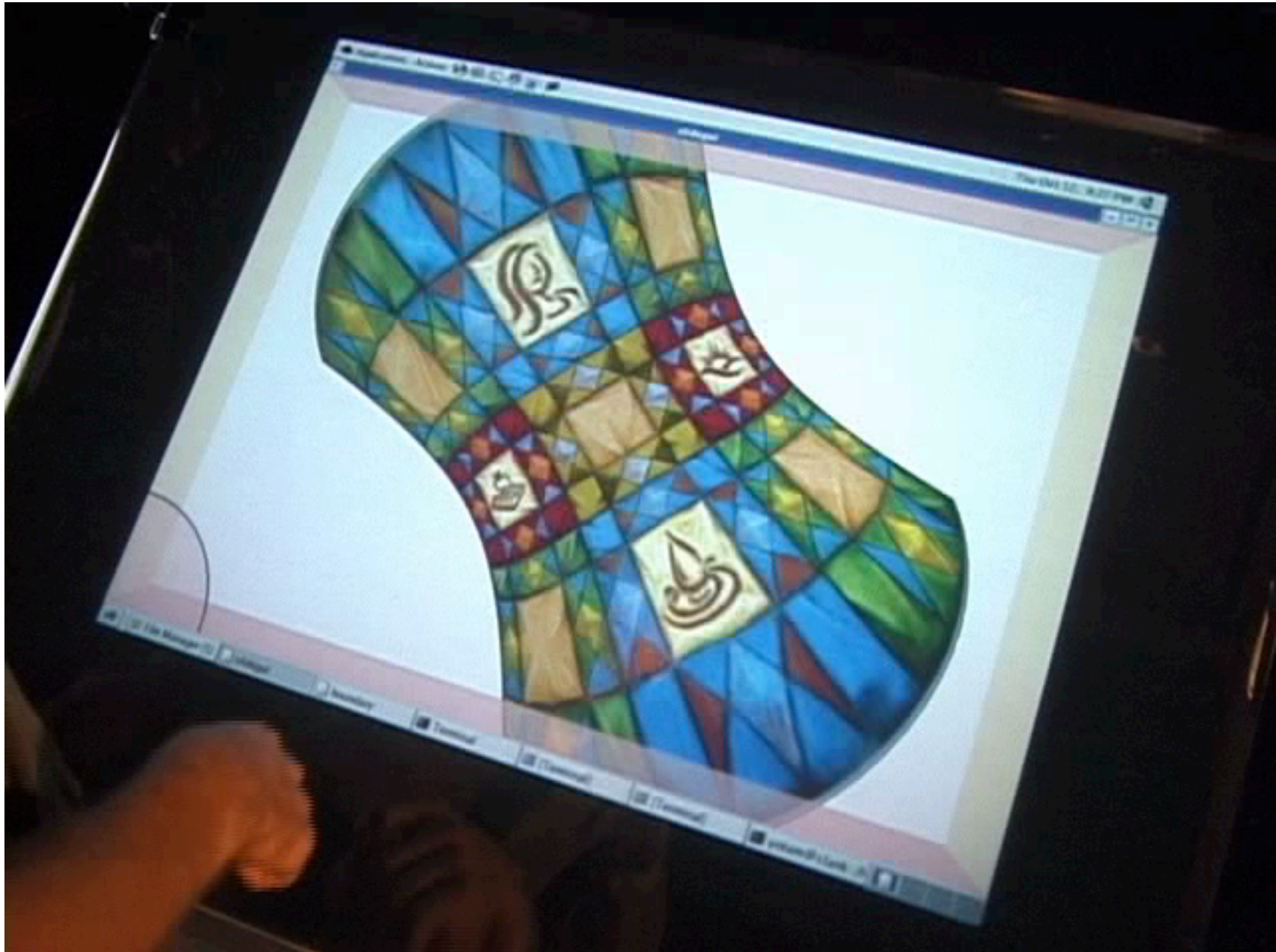
Plastic Update



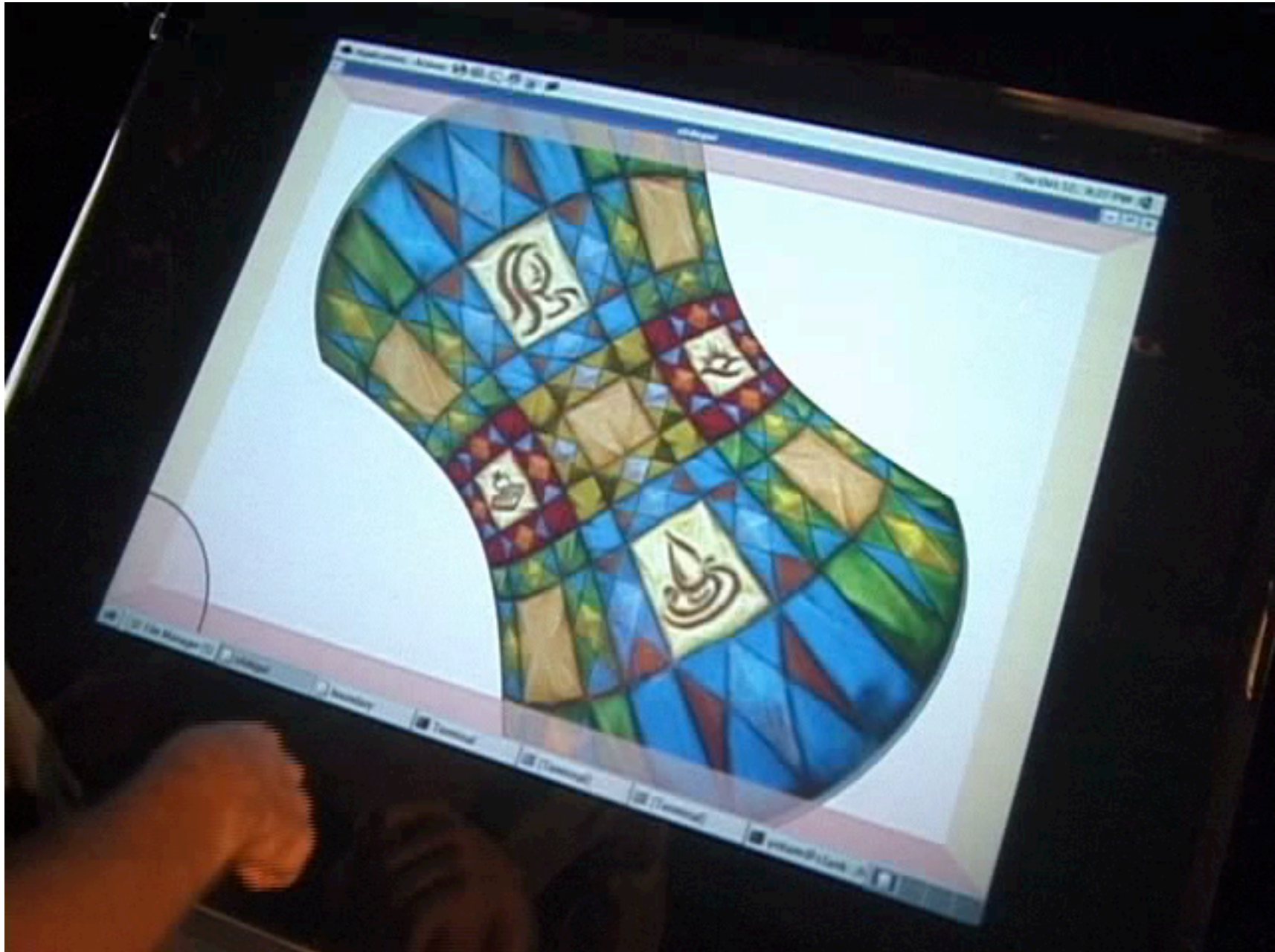
Plastic Update



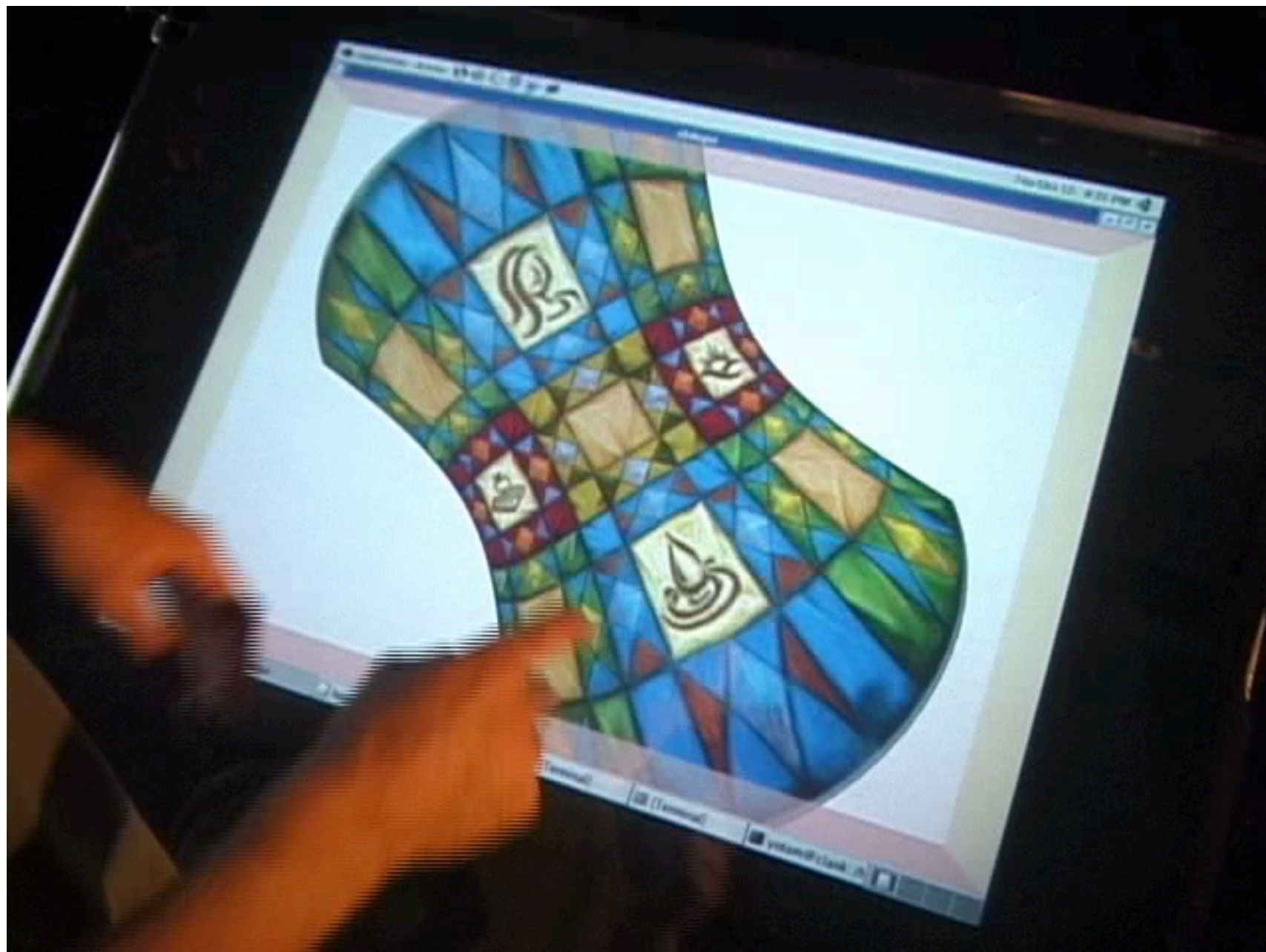
Local Deformations



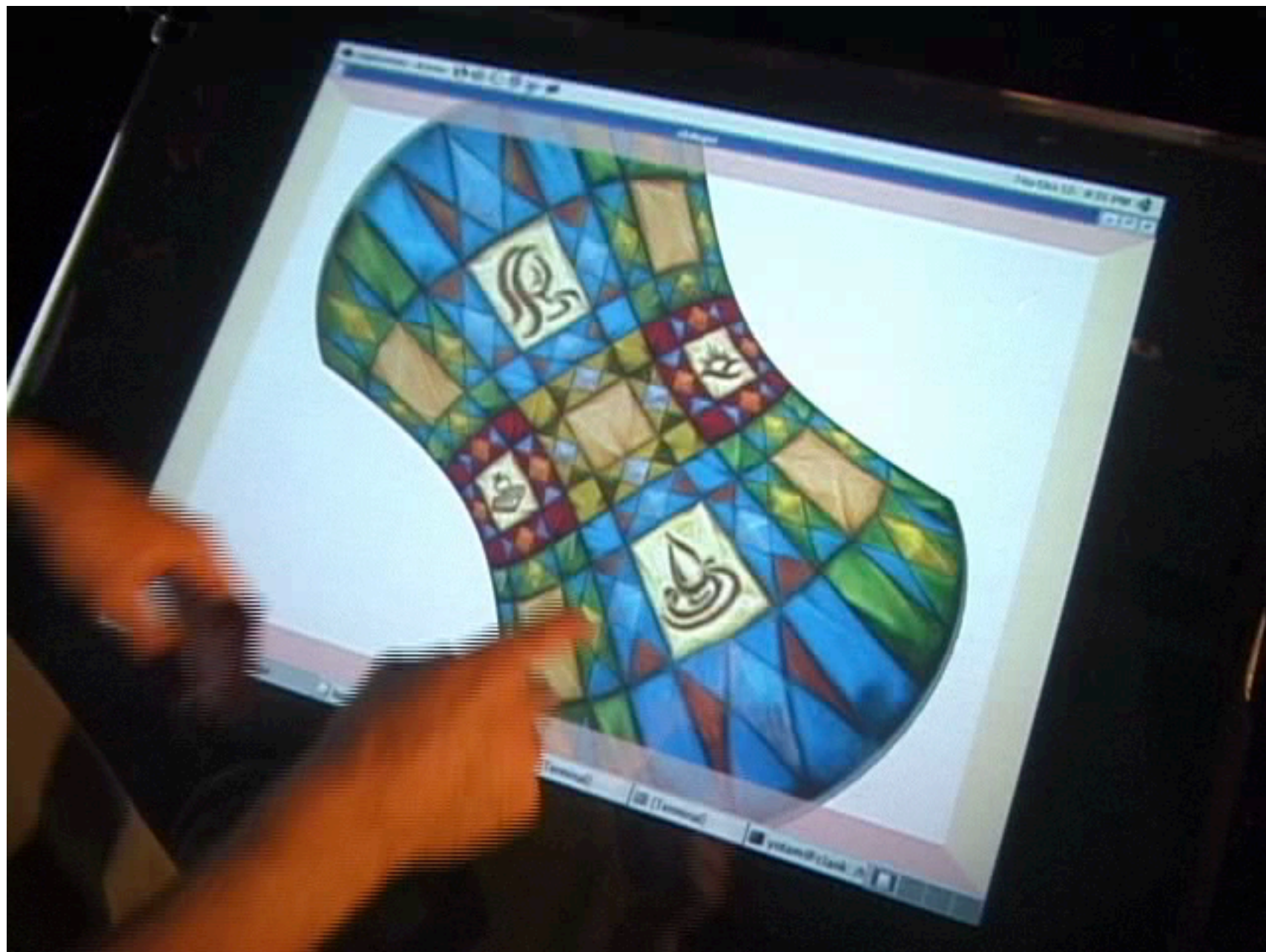
Local Deformations



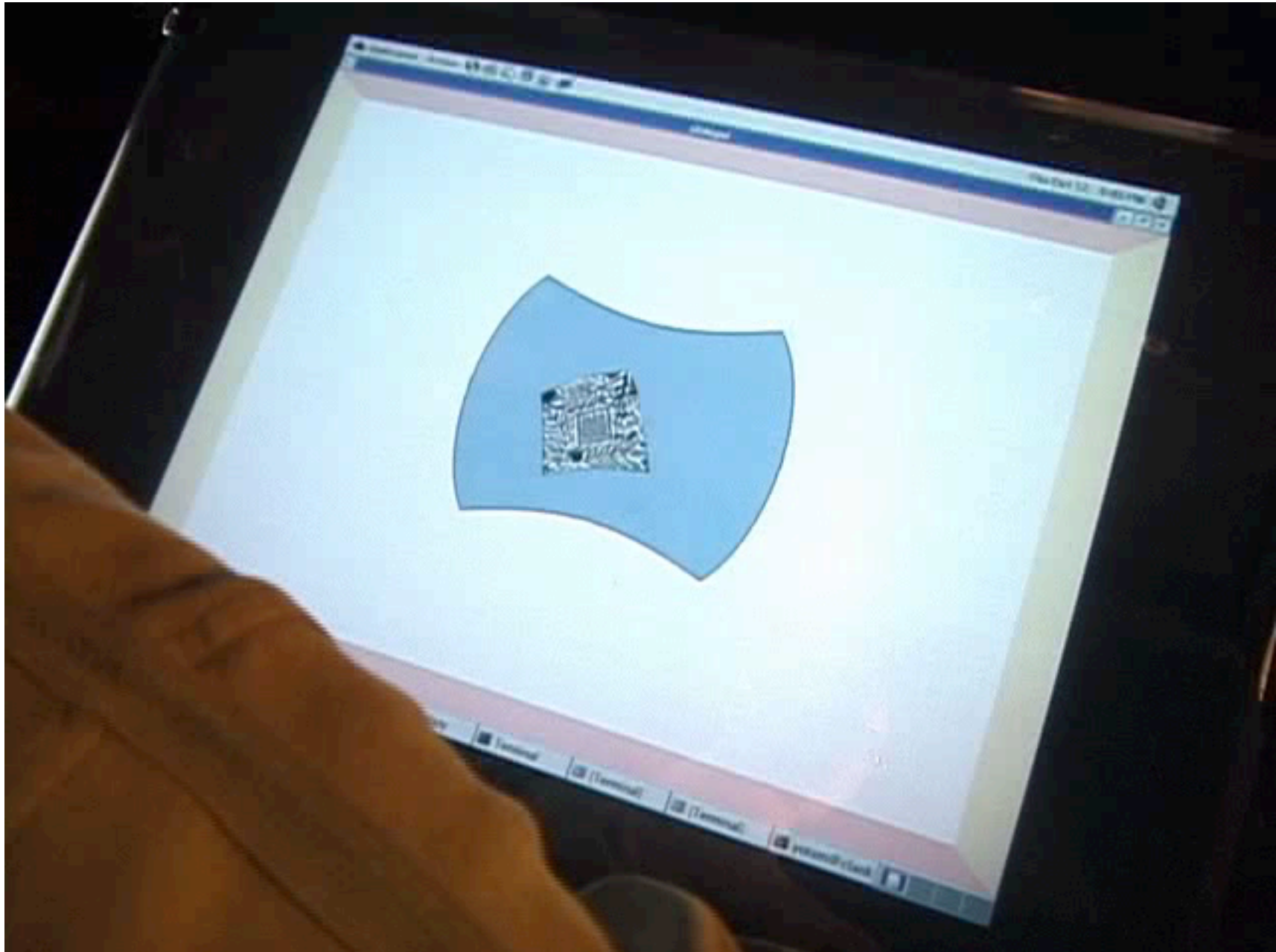
Glue



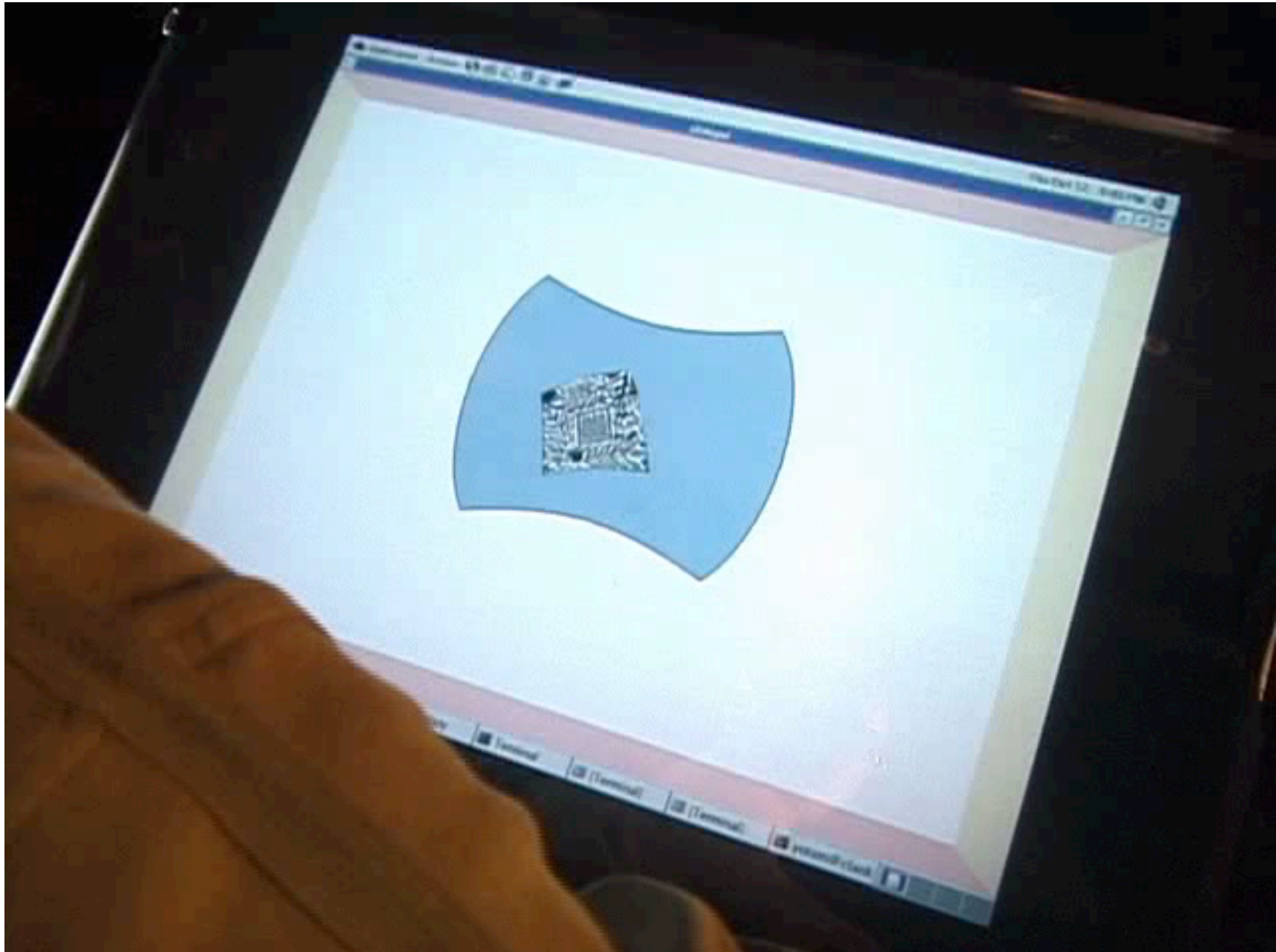
Glue



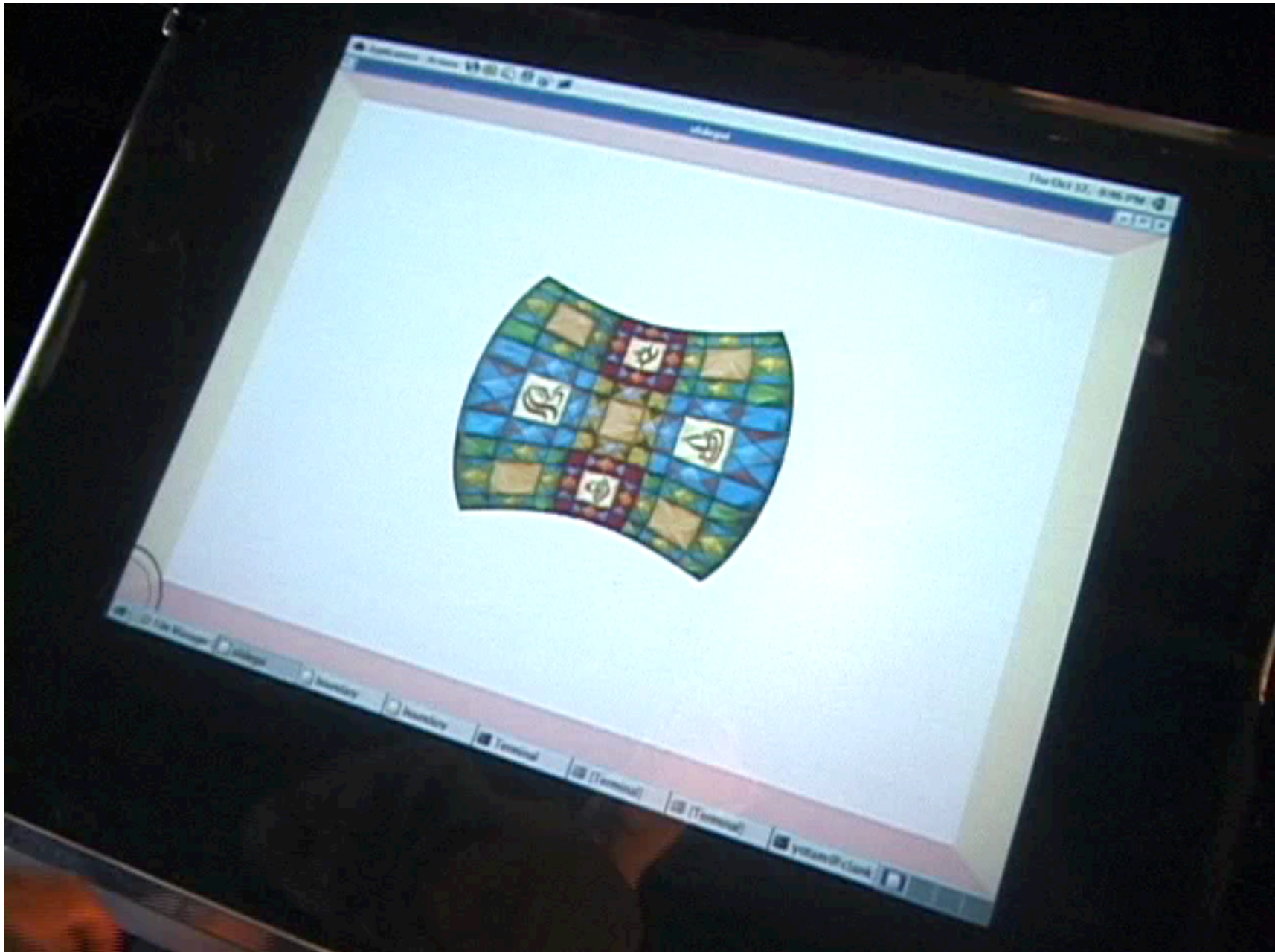
Texture Layers



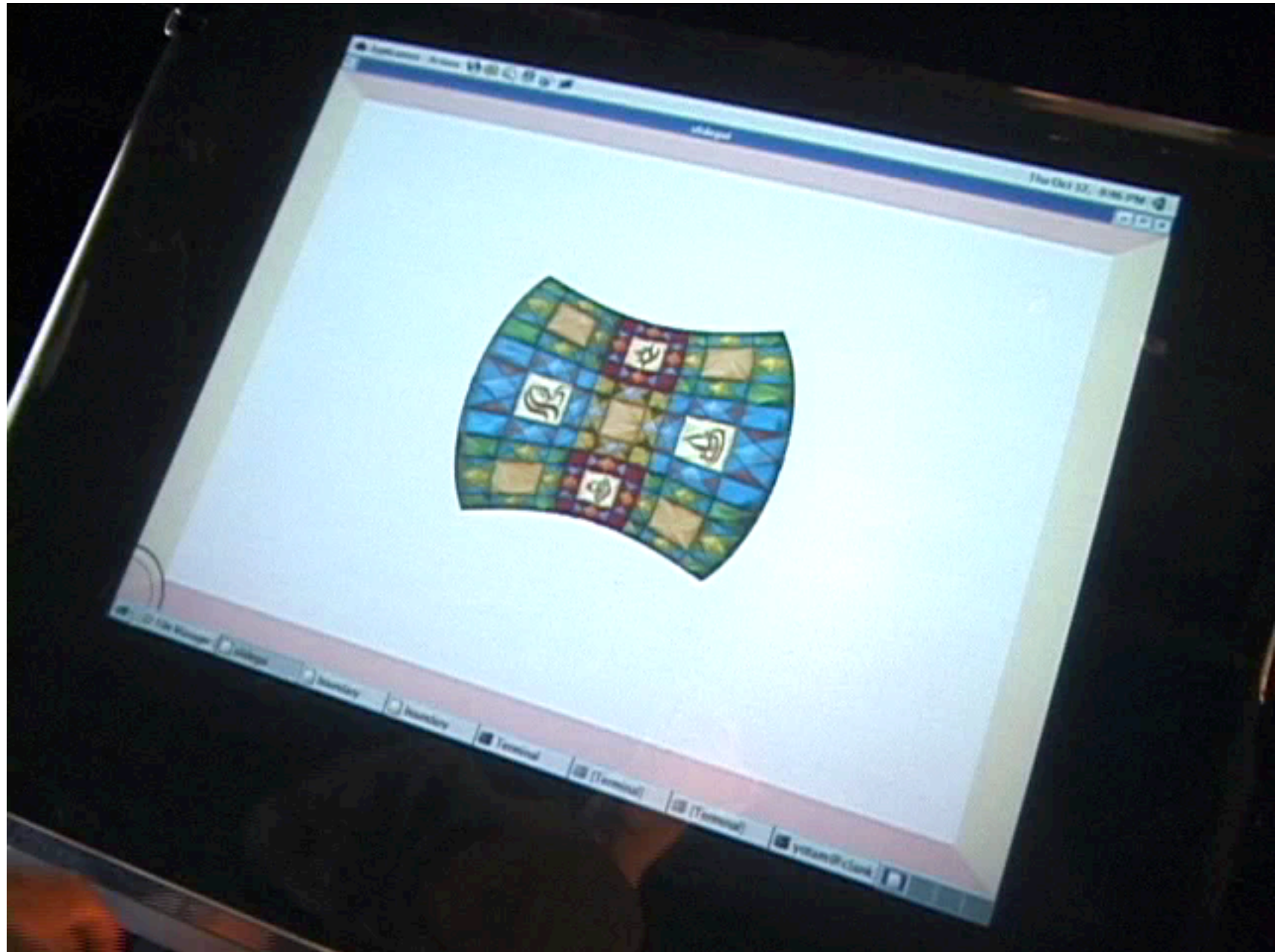
Texture Layers



Alpha Airbrush



Alpha Airbrush



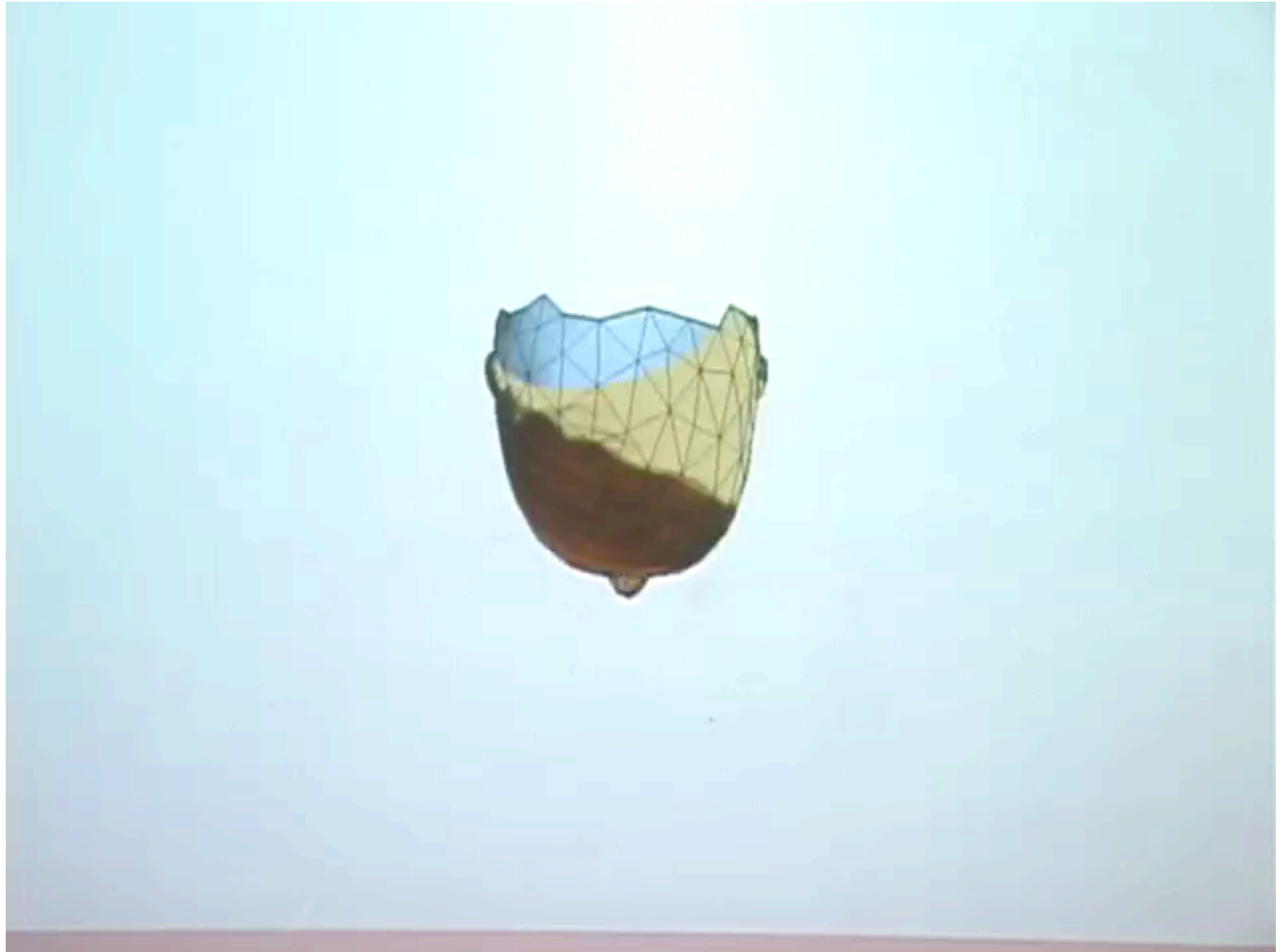
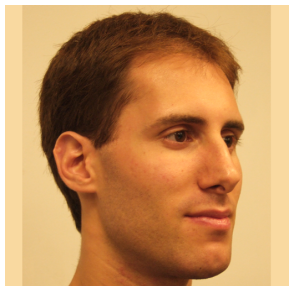
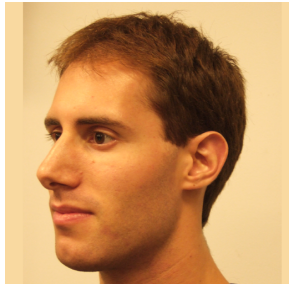
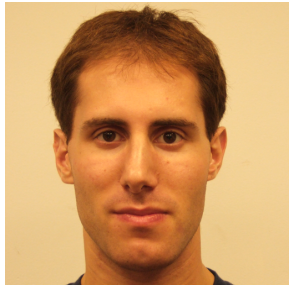
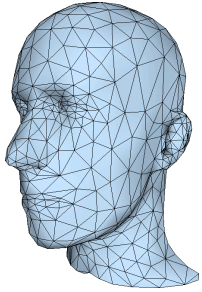
Object Positioning



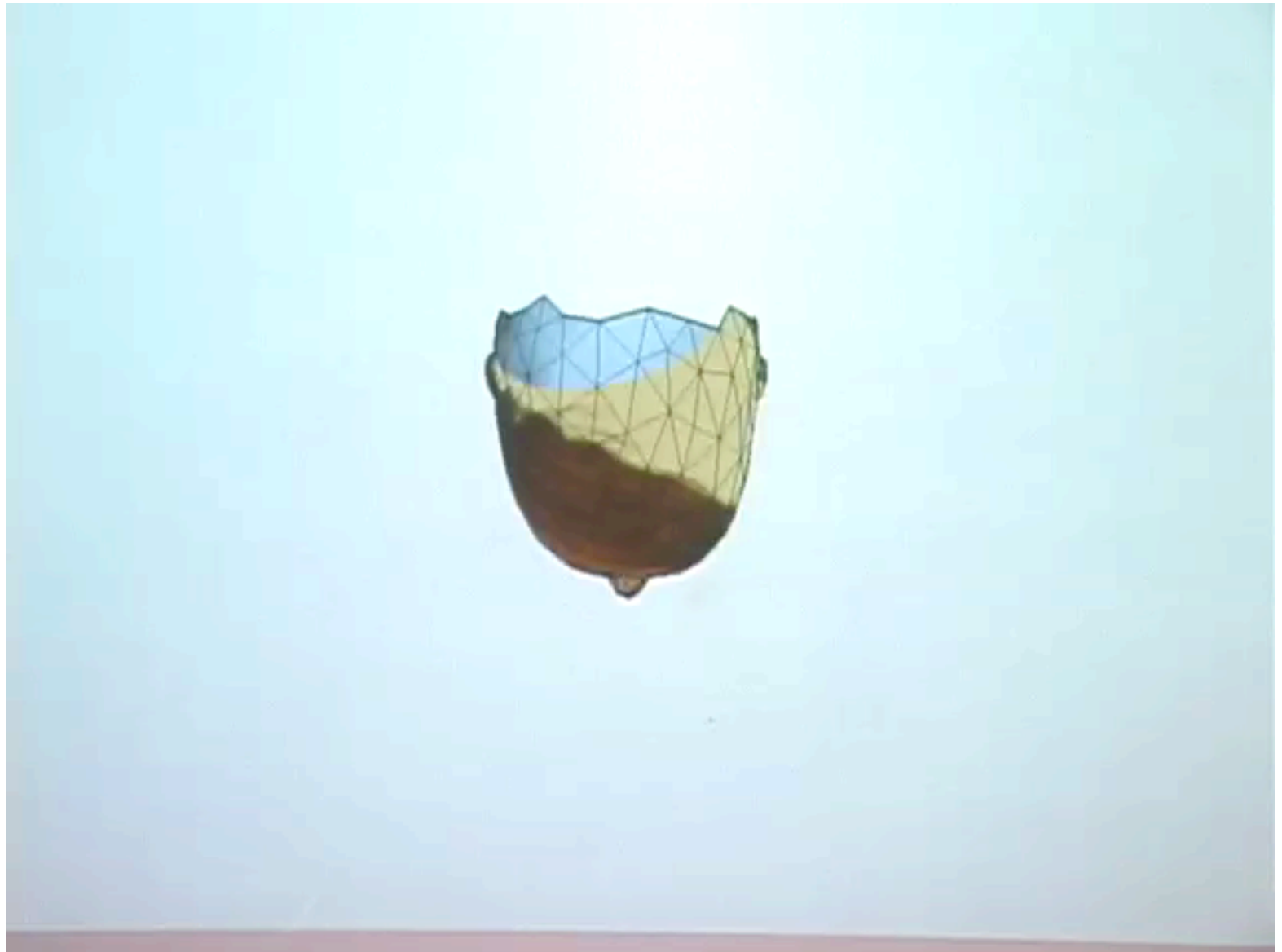
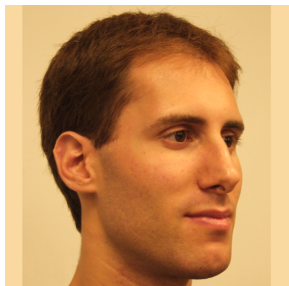
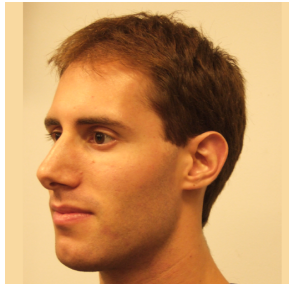
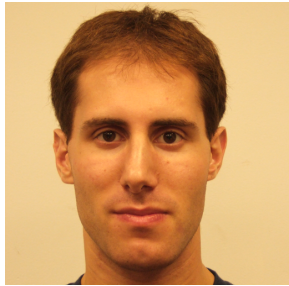
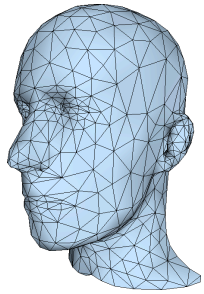
Object Positioning



Results



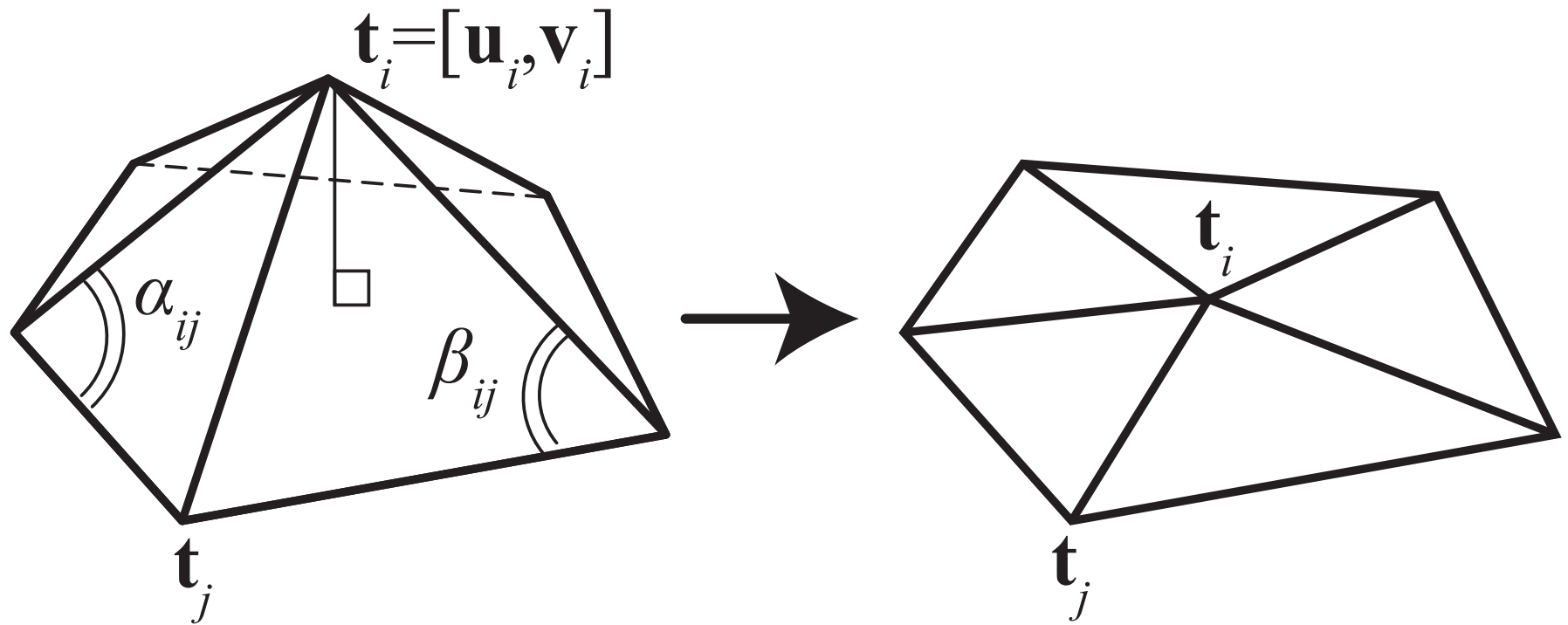
Results



3 Formulae

Parameterization Algorithm

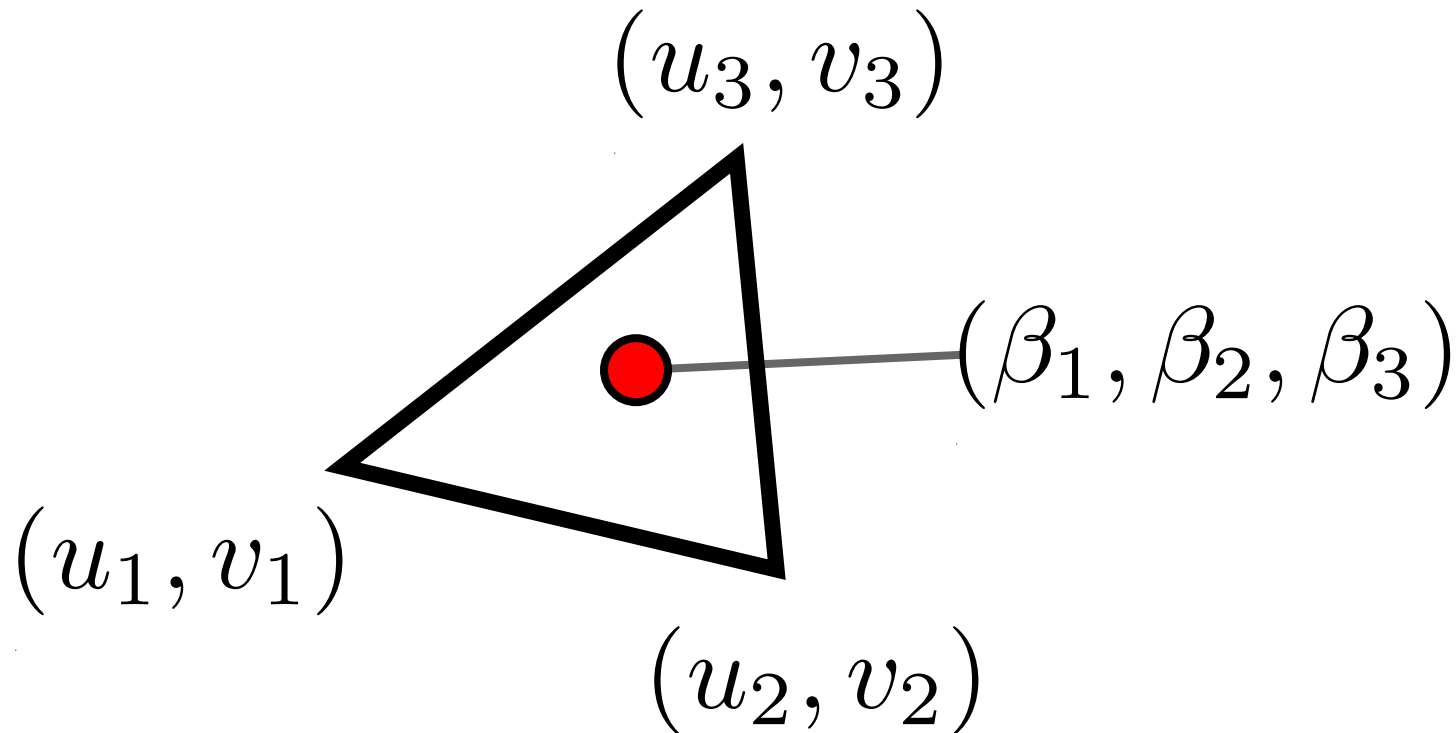
Linearized Bending Energy



$$t^T A t = E = \sum_i \frac{1}{8 \text{area}_i} \left(\sum_{j \in N(i)} (\cot \alpha_{ij} + \cot \beta_{ij}) (\mathbf{t}_i - \mathbf{t}_j) \right)^2$$

Constraints

Linear on triangles



$$\beta_1 u_1 + \beta_2 u_2 + \beta_3 u_3 = u_{fixed}$$

$$\beta_1 v_1 + \beta_2 v_2 + \beta_3 v_3 = v_{fixed}$$

Constraints

Modify system

$$A^{ext} = \begin{pmatrix} A & C^T \\ C & 0 \end{pmatrix}$$

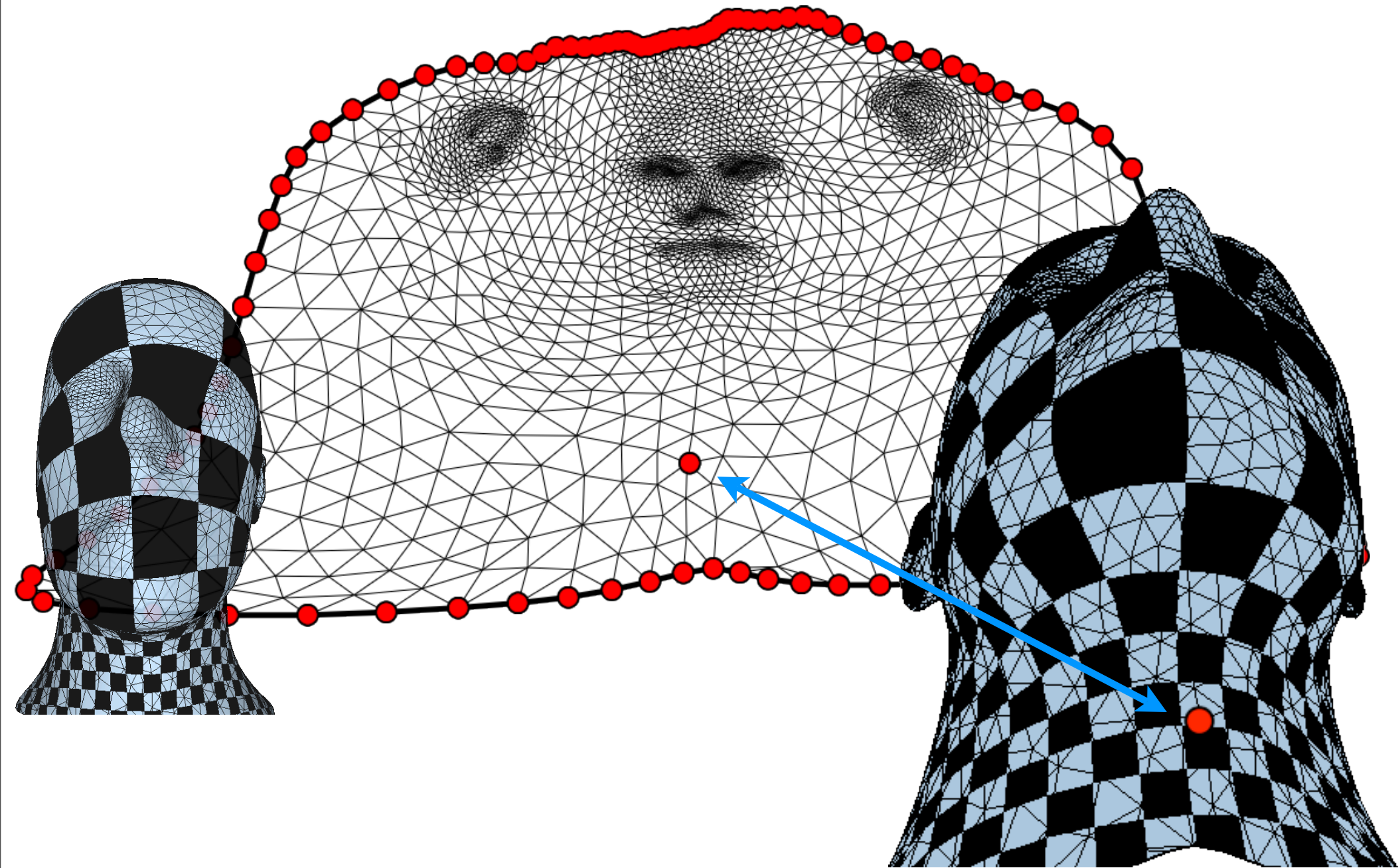
bending energy Hessian

constraints $\begin{pmatrix} \beta_1 u_1 + \beta_2 u_2 + \beta_3 u_3 = u_{fixed} \\ \beta_1 v_1 + \beta_2 v_2 + \beta_3 v_3 = v_{fixed} \end{pmatrix}$

Need a scheme for quickly updating inverse

I Technical Comparison

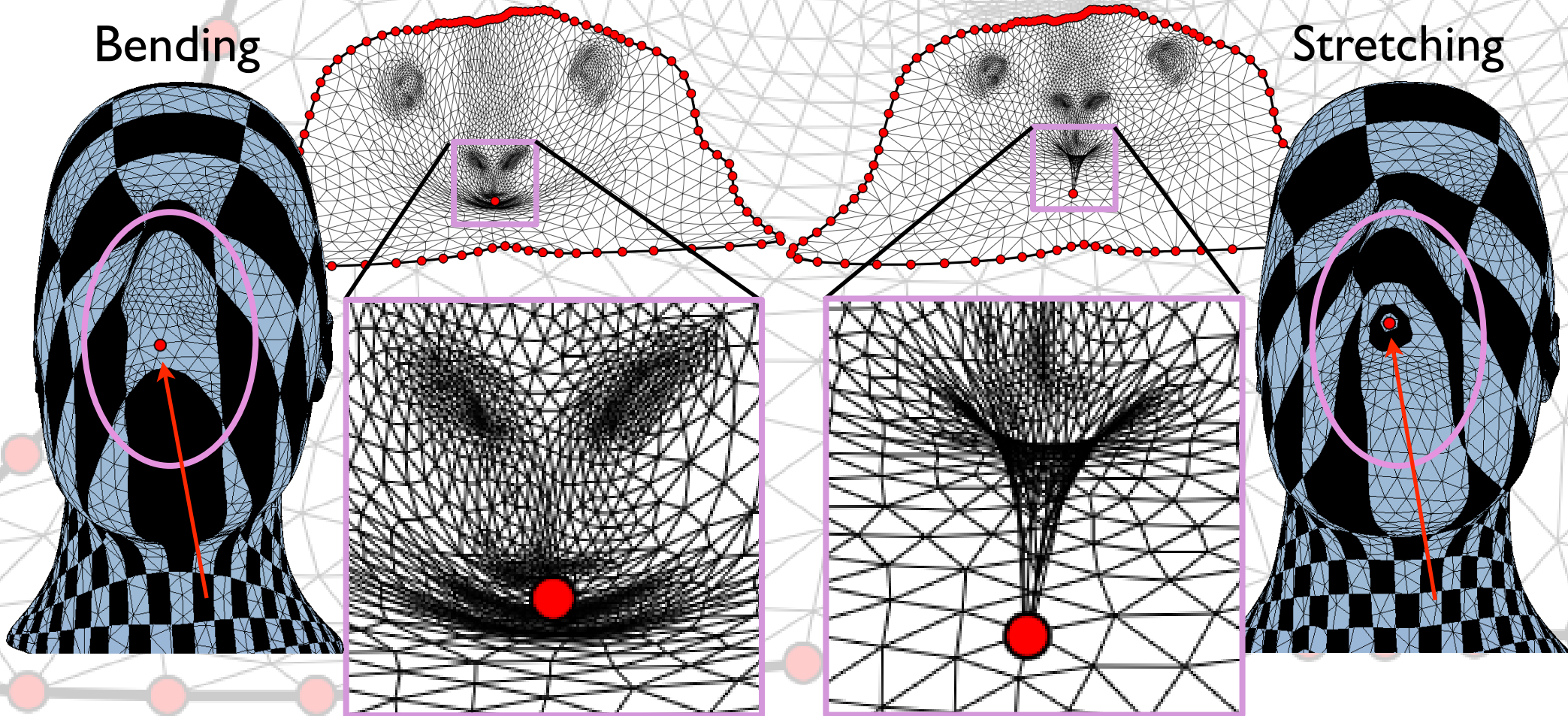
Constraint Matching



Comparison

Bending

Stretching



Contributions

System for direct manipulation of textures in 3D

Contributions

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Create textured models more easily & with less skill

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Exploits multi-touch input

Bending Energy for parameterization

Future Work

Image editing operations

Parameterization robustness

User evaluations

Acknowledgments

NYU Computer Science colleagues

Anonymous reviewers

Mike Khoury

Yotam Gingold <gingold@cs.nyu.edu>

End