

CPSC 453 Assignment 2: 3D Object Viewer

The assignment is worth 12.5% of the final mark (+ up to 4% bonus)

Due date: Tuesday, Oct. 29, 2019

Lab presentation: Monday/Tuesday, Oct. 28/29, 2019

A 3D Object Viewer

Write a viewer of 3D objects specified as polygon meshes. The viewer should meet the following specifications:

- The mesh data are given in the OBJ format (a loader will be provided by your TA).
- When the model is loaded, the front and back plane are automatically positioned so that the model is included between them, and scaled and centered so that it nicely fits in the viewport.
- The user can change the view by translating, rotating and scaling the object with the mouse.
- The user can change the projection and light direction.
- The viewer supports 4 rendering modes:
 - wireframe,
 - flat shading,
 - Gouraud (diffuse) shading,
 - Phong shading.
- For shading purposes, the viewer uses normal vectors given in the data file, or computes them itself.
- The viewer supports (color) texture mapping.

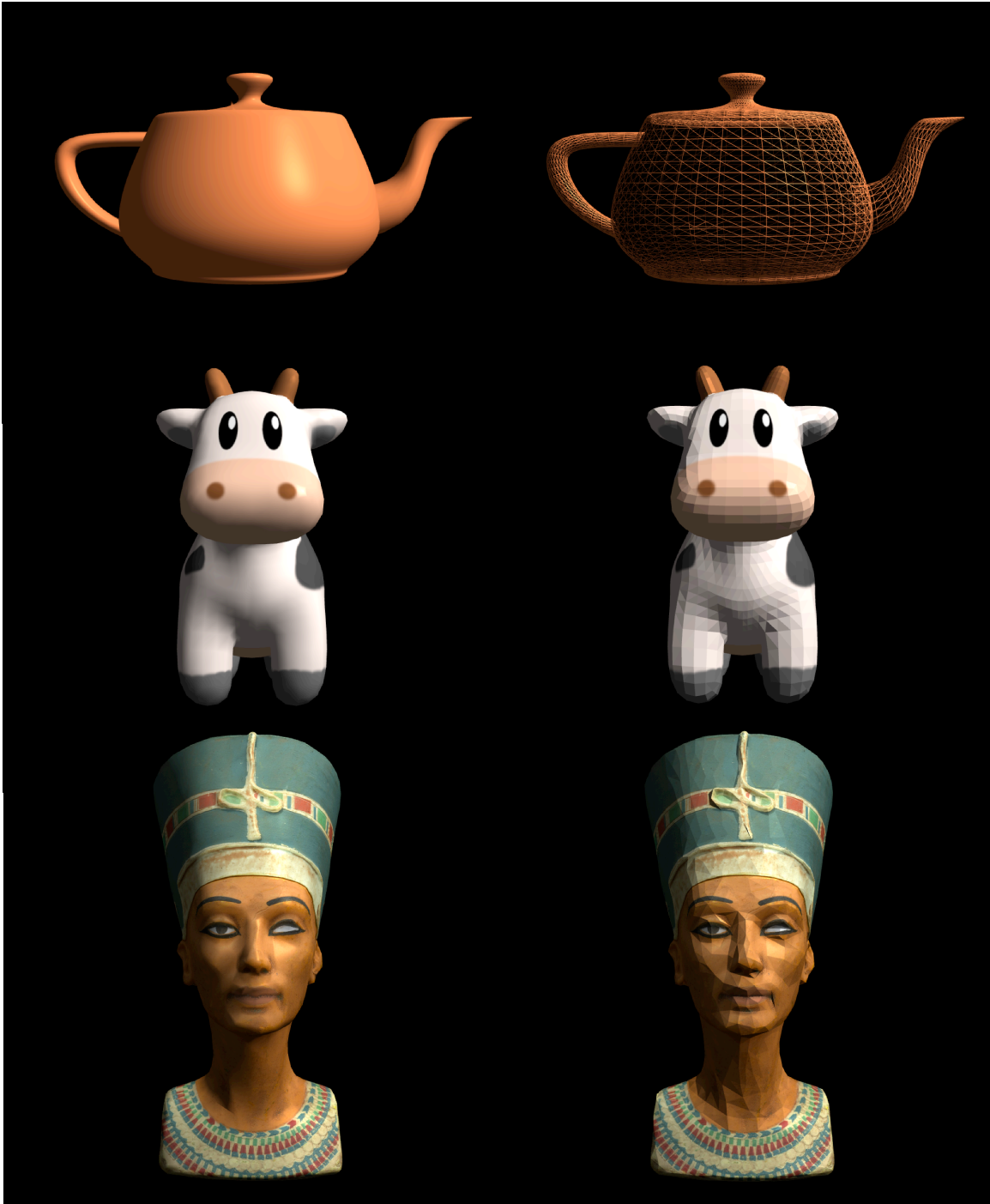
Test the viewer on data provided by your TA, representing:

- a teapot (normal vectors have to be calculated; the model does not include textures),
- a spotted animal (texture coordinates and a texture map are provided),
- Nefertiti's head (normal vectors, texture coordinates, and a texture map are provided).

Bonus

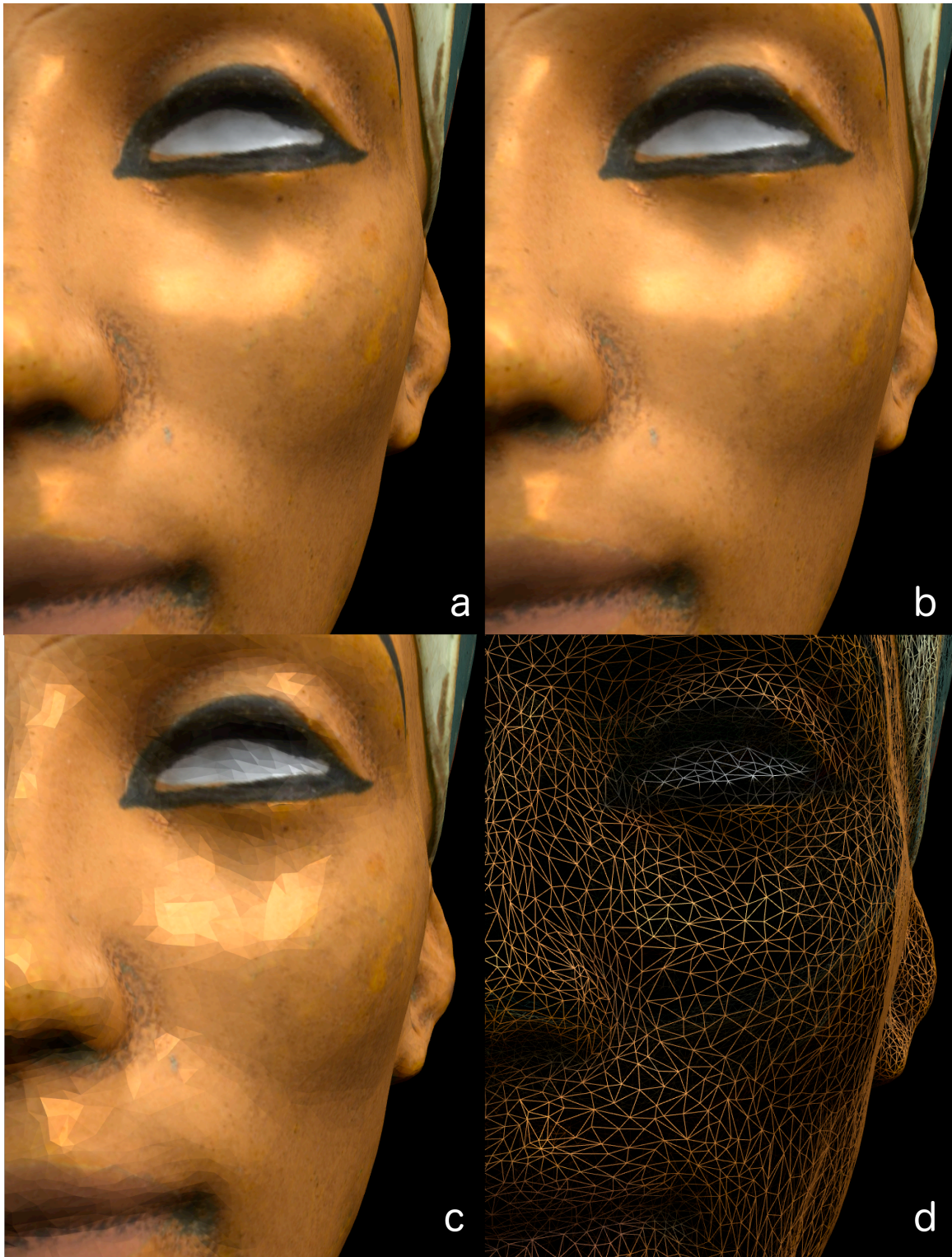
After completing the main part of the assignment, you may want to improve the visualization of the Nefertiti's head by using one or more additional textures provided with the model. These textures support:

- bump mapping,
- normal mapping,
- occlusion mapping,
- specular mapping,
- displacement mapping.



Sample models

Left column is comprised of the teapot, spot, and Nefertiti (low polygon) models rendered using Phong shading. The right column is comprised of the wireframe teapot, and flat shaded spot and Nefertiti (low polygon).



Sample model Nefertiti (high polygon)

Above are close-up renderings of the Nefertiti (high polygon) using a) Gouraud shading, b) Phong shading, c) flat shading, and d) wireframe.



Sample model Nefertiti (high polygon)

Left is a rendering of the Nefertiti (high polygon) with Phong shading; right is the same model, additionally with normal mapping, occlusion mapping, and specular mapping.

Render settings

All images above were rendered with the following settings:

- Camera position, (0,0,3),
- Camera look at, (0,0,0)
- Camera field-of-view, 30 degrees
- Light position, (10, 10, 10)
- Light colour, (1, 1, 1)
- Ambient strength, 0.2
- Specular strength, 0.5
- Specular exponent, 32