4. Z-buffer

Consider an orthographic scene with objects listed below being rendered at 5 by 5 pixels, with the view plane at z=0 (looking along the positive z axis). Show the state of the z-buffer (with numbers) once these squares have been rendered (without using anti-aliasing or sub-sampling). Note that the pixels are drawn such that the z-buffer values are stored halfway between integers (look at the labels below the z-buffer).

There is a red square with corners at
(0, 0, 1),
(1, 0, 1),
(1, 1, 1),
(0, 1, 1).

There is a green square with corners at
(2, 2, 2),
(4, 2, 2),
(4, 4, 2),
(2, 4, 2),

and a blue square with corners at
(0, 0, 3),
(4, 0, 3),
(4, 4, 3),
(0, 4, 3).

\[
\begin{array}{cccccc}
\infty & \infty & \infty & \infty & \infty & \infty \\
3 & 3 & 2 & 2 & \infty \\
\text{BLUE} & \text{BLUE} & \text{GREEN} & \text{GREEN} & \\
3 & 3 & 2 & 2 & \infty \\
\text{BLUE} & \text{BLUE} & \text{GREEN} & \text{GREEN} & \\
3 & 3 & 3 & 3 & \infty \\
\text{BLUE} & \text{BLUE} & \text{BLUE} & \text{BLUE} & \\
1 & 3 & 3 & 3 & \infty \\
\text{RED} & \text{BLUE} & \text{BLUE} & \text{BLUE} & \\
0 & 1 & 2 & 3 & 4 & 5
\end{array}
\]
3. Color Spaces

a) In the HSV color model, starting with a pure red color, describe the effect that adding more white, black, etc... has on H, S, and V. Define 'adding more' as moving in the color space in the direction of the new color. Use the terms constant, increase, or decrease to describe the change.

<table>
<thead>
<tr>
<th>Add white</th>
<th>Hue</th>
<th>Saturation</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Constant</td>
<td>decrease</td>
<td>constant / increase</td>
</tr>
<tr>
<td>Add black</td>
<td>constant</td>
<td>constant</td>
<td>decrease</td>
</tr>
<tr>
<td>Add gray</td>
<td>constant</td>
<td>decrease</td>
<td>decrease / constant</td>
</tr>
<tr>
<td>Add yellow</td>
<td>increase</td>
<td>constant / decrease</td>
<td>constant</td>
</tr>
<tr>
<td>Add cyan</td>
<td>constant</td>
<td>decrease</td>
<td>constant</td>
</tr>
</tbody>
</table>

b) In the RGB color model, starting with a pure red color, describe the effect that adding more white, black, etc... has on R, G, and B. Define 'adding more' as moving in the color space in the direction of the new color. Use the terms constant, increase, or decrease to describe the change.

<table>
<thead>
<tr>
<th>Add white</th>
<th>Red</th>
<th>Green</th>
<th>Blue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>constant</td>
<td>increase</td>
<td>increase</td>
</tr>
<tr>
<td>Add black</td>
<td>decrease</td>
<td>constant</td>
<td>constant</td>
</tr>
<tr>
<td>Add gray</td>
<td>decrease</td>
<td>increase</td>
<td>increase</td>
</tr>
<tr>
<td>Add yellow</td>
<td>constant</td>
<td>increase</td>
<td>constant</td>
</tr>
<tr>
<td>Add cyan</td>
<td>decrease</td>
<td>increase</td>
<td>increase</td>
</tr>
</tbody>
</table>
2. Material Properties and Lighting

Draw a goniometric diagram for each of the following materials:

Diffuse Chalk:

Shiny Glass:

Gold:

A mirror:
(b) Given the following code, draw the polygon rendered.

counter-clockwise

Starting at the polygon-left and proceeding
region of the texture containing the "7" key
FOUR corners of rectangular bounding the
a) while on the n'th coordinates of the

L. Texture

CMEPS 160 - Final Exam
CMPS 160 – Final Exam

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SOLUTIONS

CMPS 160 F07
Introduction to Computer Graphics
Nov 30, 2007

Final Exam

You have the entire class period to complete this exam.

All pages are worth an equal amount.

Partial credit will be given for clear evidence of correct reasoning even if the final solution is incomplete.

No books
One page hand written notes
Calculators allowed
No computers