HOMEWORK ASSIGNMENT 5 (THEORY)

CO19-320322: COMPUTER GRAPHICS
320322: GRAPHICS AND VISUALIZATION

Fall 2016

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Due: Friday, October 21, 2016, at 8pm.

Problem 5: Raster Graphics *(5+4+6=15 points)*

Let $\mathbf{v}_1^p = (0.5, 0)$ and $\mathbf{v}_2^p = (4, 2.5)$ be the end points of an edge of a polygon after projection to the 2D Cartesian coordinate system of the screen. The resolution of the screen shall be 4×4 pixels. The origin of the 2D Cartesian screen coordinates is assumed to be at the upper left corner. The polygon shall have a yellow color.

(a) *Scan Conversion.*

- Apply the DDA algorithm to the projected edge.
- Apply the Bresenham algorithm to the projected edge. List the error after each step.
- Draw the results.

(b) *Visibility.* Assume that all pixels that lie "above" the edge connecting the projected points $\mathbf{v}_1^p$ and $\mathbf{v}_2^p$ are covered by the polygon and that the depth of the polygon is constant 2. Further assume that (before rendering the polygon) the color buffer to which we are rendering is completely black and that the depth buffer stores the following entries:

3	3	1	1
1	3	3	3
42	42	42	42
1	1	42	42

Compute the new color-buffer and depth-buffer entries after rendering the polygon.

(c) *Anti-aliasing.*

- Assuming the same set-up as in (b), compute how the new color-buffer and depth-buffer entries differ from the result in (b) when switching on a 2×2-subpixel supersampling anti-aliasing.
- Recompute the anti-aliased result when assuming a rotated grid (by $45°$) for the 2×2-subpixel supersampling anti-aliasing.

Remarks: The theoretical assignments have to be submitted in paper form into the box labeled "Linsen" in the Research I entrance hall. In case the theoretical part is typed (e.g., using LaTeX), the generated PDF-file can also be uploaded to jGrader.