Sample Test 5: Surfaces, Textures

– State any simple, reasonable assumption used to arrive at your answer.
– A 'yes' or 'no' answer without reasoning is worth 0 points.
– Zero points if the writing is hard to decipher. Use a black pen if in doubt.
– Indicate with arrow if you use the back of the previous page (last page for page 1).

1 Surface Patches

A patch $\mathbf{p}$ in Bernstein-Bézier form has coefficients

$$\begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} \quad \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \quad \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$$

1. ([1 pts]) What is the degree?
2. ([2 pts]) evaluate $\mathbf{p}$ at $u = v = 0.5$ using DeCastejau's algorithm.
3. ([2 pts]) compute the normal $\mathbf{p}$ at $u = v = 0.5$.
4. ([3 pts]) A second patch in Bézier form has coefficients

$$\begin{bmatrix} -1 \\ 1 \\ b \end{bmatrix} \quad \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} -1 \\ 0 \\ c \end{bmatrix} \quad \begin{bmatrix} a \\ 0 \\ 0 \end{bmatrix}$$

Determine a,b and c so that the two patches join smoothly.

2 Texture Mapping

([3] points) Generalized subdivision algorithms, such as 'subd' in 'blender' work by repeatedly cutting off (sharp) edges and refining the polyhedron. How would you texture map a subdivision surface? That is, what is a good choice of texture coordinates?

(1 point) Can one texture a face without distortion using a flat rgb texture?