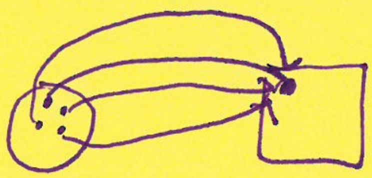
Texturing (pt 2) March 5

Competing goals for ϕ:

Bijective:

injective (1-1): each point from texture comes from one point on model

surjective (onto): each point in texture is target from the model



Size distortion: size of texture approx const accross surface

(intuition) points on the surface that are ~~close~~ dist d they map to tex coords that have about dist d (scaled)

(math) mag of deriv of ϕ should not change too much

shape distortion: not too distorted

(intuit) circles on surface of shape
should map to ~~neighborhood~~
approx circles in texture

(math) directional deriv doesn't change too much
in diff directions

continuity: no too many "seams"

(inuit) neighborhood of points on shape
map to neighborhood of points in texture

(math) ϕ is continuous

Eg w/ sphere

$$f : [0,1]^2 \to [0,\pi] \times [0,2\pi]$$

$$(u,v) \mapsto (\pi u, 2\pi v)$$

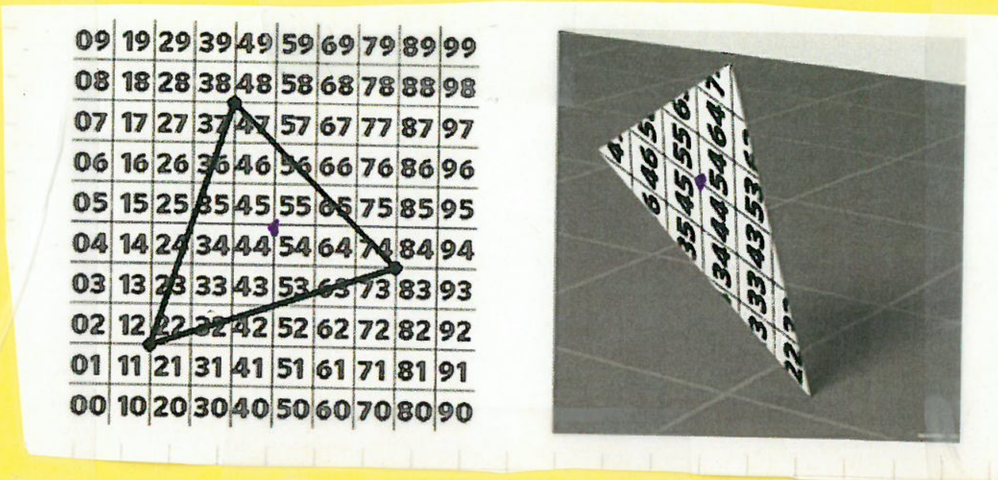
$$g : [0,\pi] \times [0,2\pi] \to S^2$$

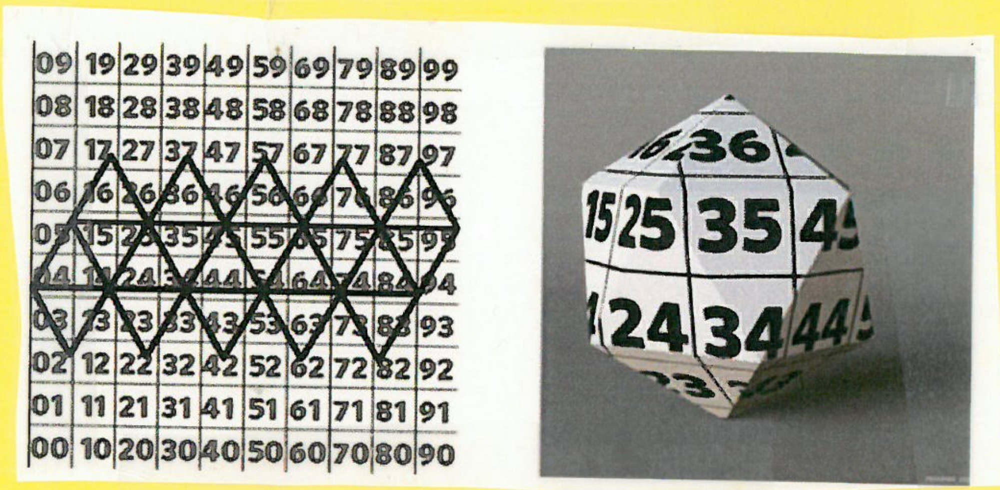
$$(\alpha,\beta) \mapsto (\cos(\alpha)\sin(\beta), \sin(\alpha)\sin(\beta), \cos(\beta))$$

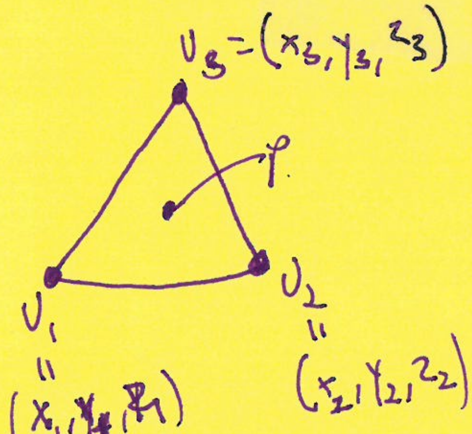
$$g \circ f : T \to S^2$$

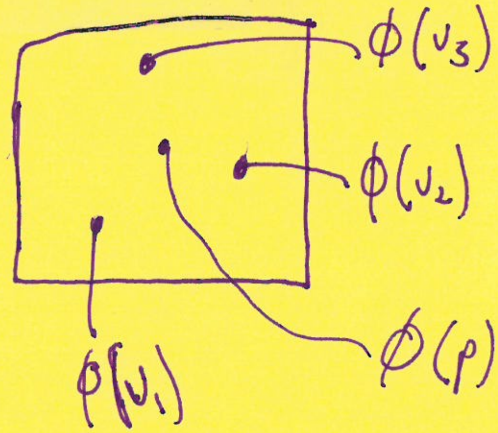
$$\phi = (g \circ f)^{-1}$$

$$\phi(x,y,z) = \left([\pi + \mathrm{atan}(y,x)]/2\pi, \; [\pi - \mathrm{acos}(\tfrac{z}{|x|})]/\pi \right)$$









Barycentric Interpolation

b ~~= as_barycentric~~(v_1, v_2, v_3, p)

~~(u,v)~~

⋮

$$b = as\_barycentric(v_1, v_2, v_3, p)$$

$$(u_1, v_1) = as\_tex(v_1)$$

$$(u_2, v_2) = as\_tex(v_2)$$

$$(u_3, v_3) = as\_tex(v_3)$$

$$\begin{bmatrix} u_p \\ v_p \end{bmatrix} = b.alpha \begin{bmatrix} u_1 \\ v_1 \end{bmatrix} + b.beta \begin{bmatrix} u_2 \\ v_2 \end{bmatrix} + b.gamma \begin{bmatrix} u_3 \\ v_3 \end{bmatrix}$$