Final Project

Group #24

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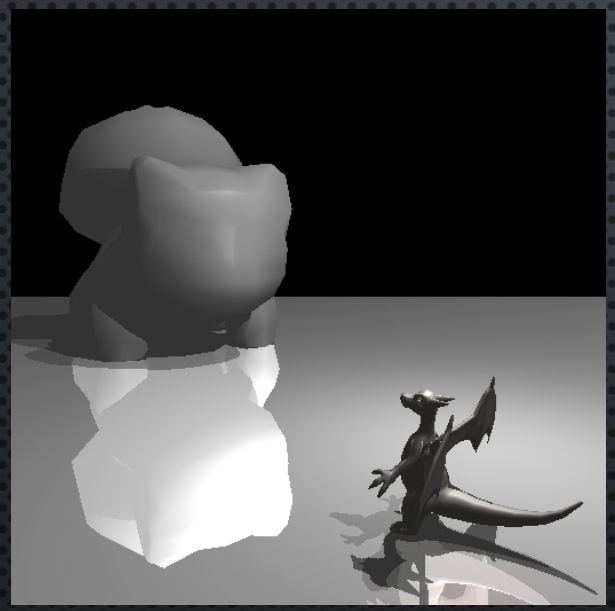
Mesh Intersection

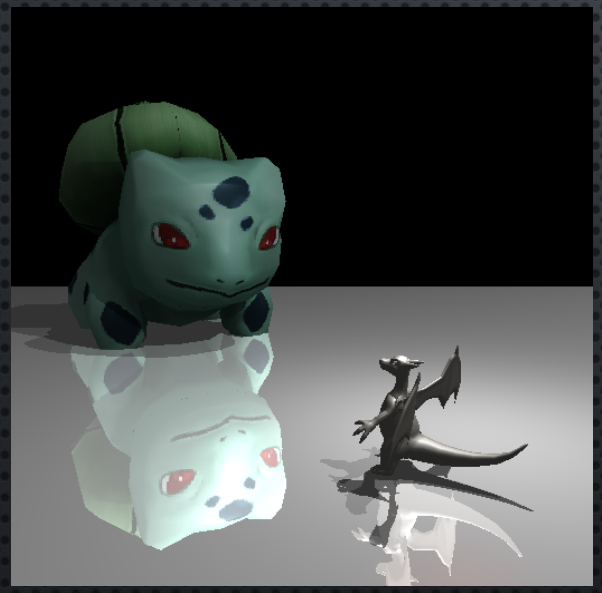
- Calculate the intersection point of the ray and the plane of the triangle
- Whether the point is in the triangle

Texture Map



Soft Shadow

- Consider point light as area light
- Use random number to change position of light point



- Without Soft Shadow

- With Soft Shadow (49)

- With Soft Shadow (100)

Texture Tiling

Use u and v to look up the value in the texture

When u and v is inside the range [0, 1]

$$u = clamp(u, 0, 1)$$
$$v = clamp(v, 0, 1)$$

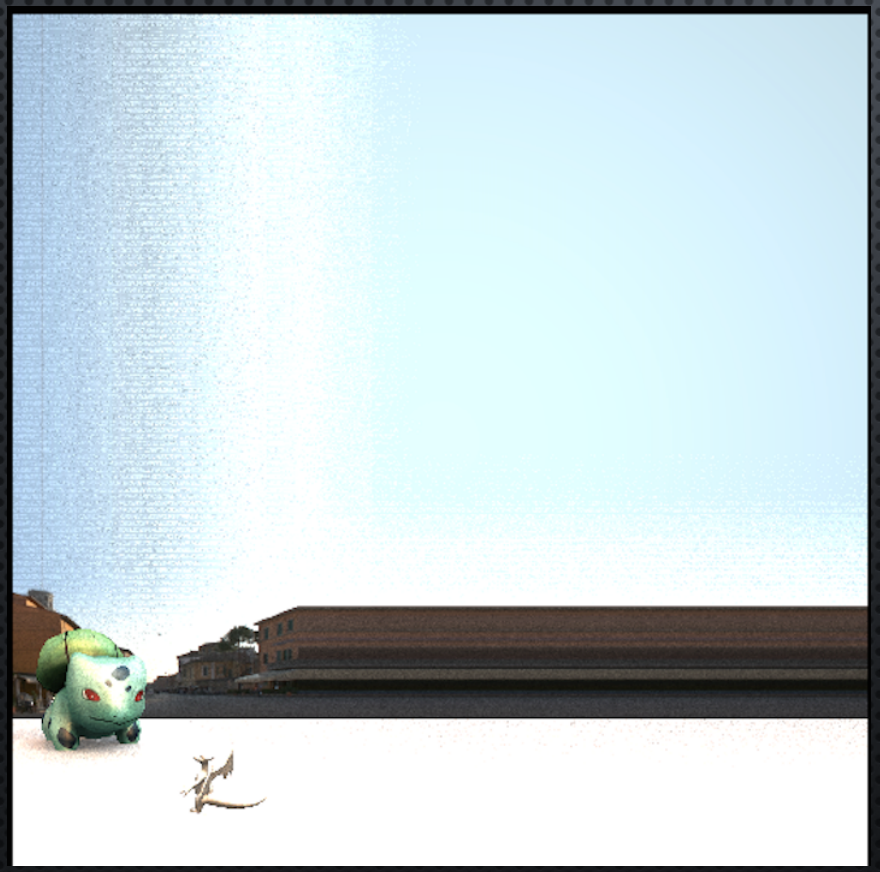
When u and v is outside the range [0, 1]

$$u = \begin{cases} u - (int)u & if\ u > 0 \\ u - (int)u + 1 & if\ u < 0 \end{cases}$$

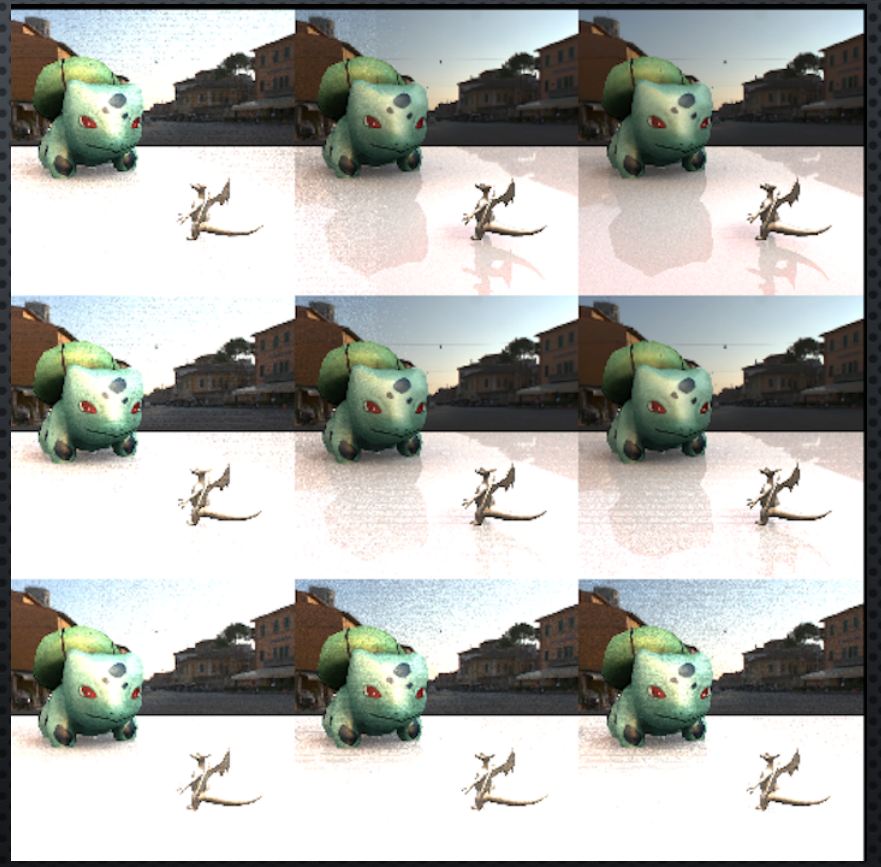
$$v = \begin{cases} v - (int)v & if\ v > 0 \\ v - (int)v + 1 & if\ v < 0 \end{cases}$$

Texture Tiling

Not Applied tiling



Applied tiling



Environment Illumination

- $C_l = L * background \ / \ pdf$

  - pdf is the second value returned by the built-in function sample_brdf
  - background is the attribute value looked up in the background image

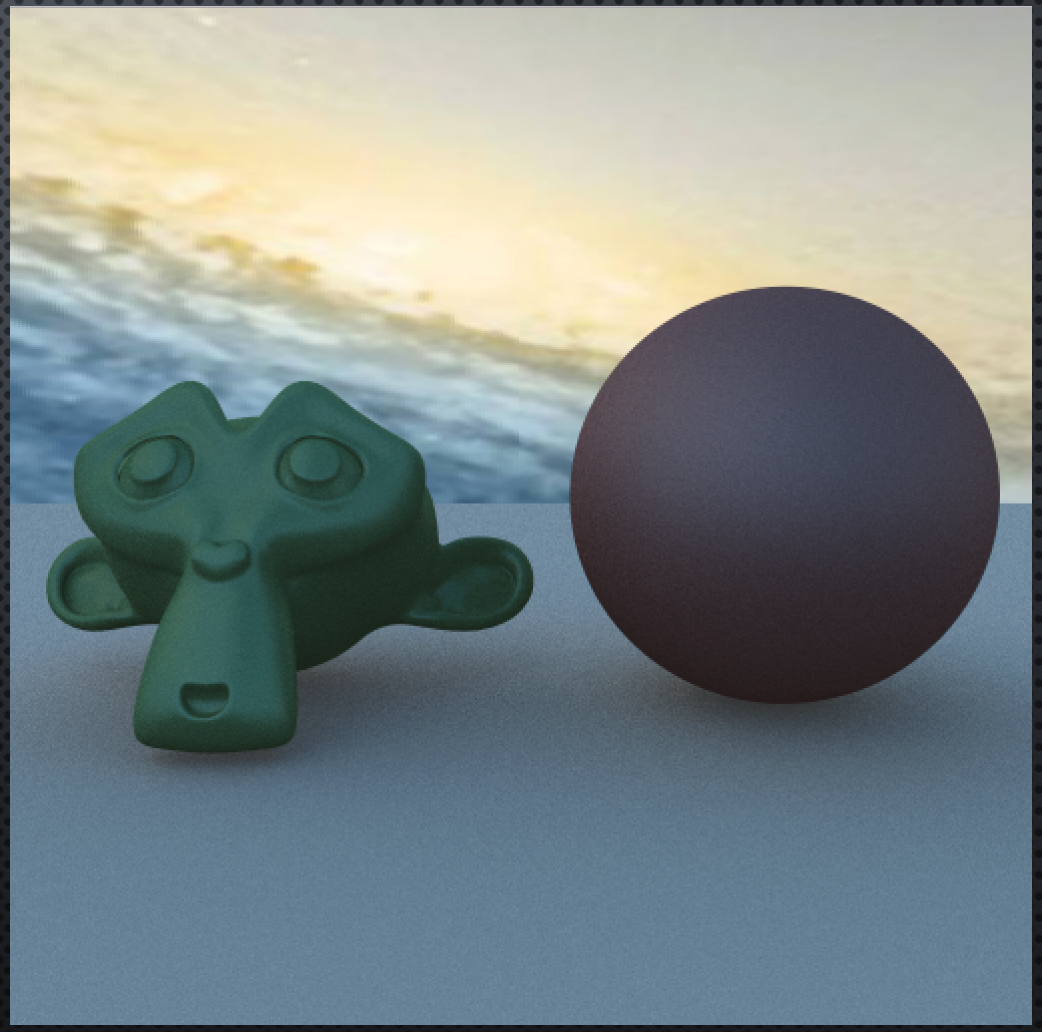
$$u = \frac{atan2(direction.x, direction.z)}{2 * \pi}$$

$$v = 1 - \frac{\text{acos}(direction.y)}{\pi}$$

- $L = brdf * cos$

  - brdf is bidirectional reflectance distribution function used to characterize the directional properties of how a surface reflects light
  - cos can be computed by the dot value of direction and normal

Environment Illumination



Bezier Surface Patches

- Definition

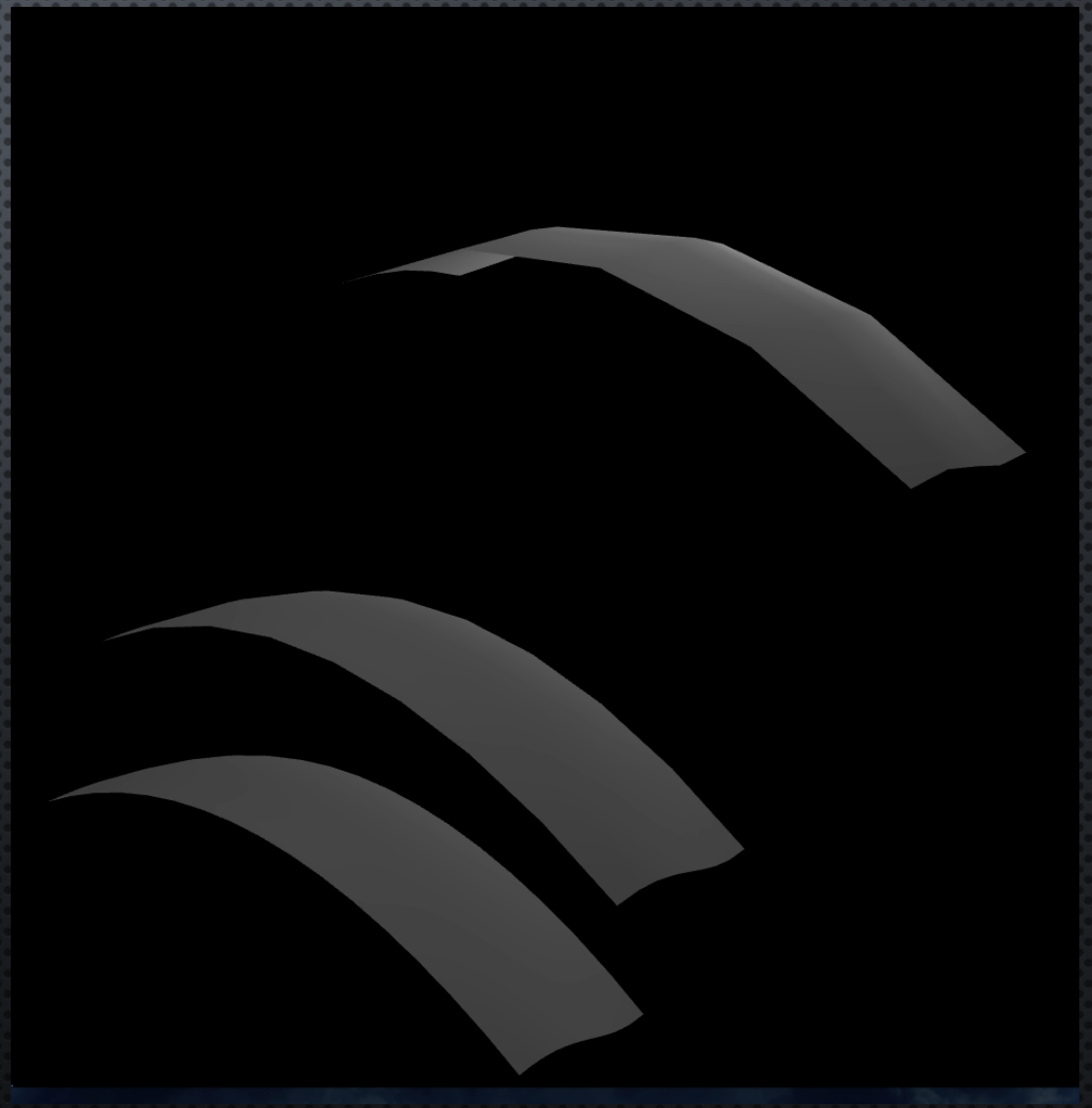
three dimensional Bezier surface patches can be defined by a grid of sixteen control points. These can be though of as four rows, with each row being a 2D Bezier curve.

- Implementation

Each row of four control points can be thought of as a separate 2D Bezier curve. If we first compute a point on each of the curves for a given value of u , we can then treat these new points as the control points for 2D Bezier curves running down the columns. Thus, for a given value of (u,v), a point Q on a Cubic Bezier surface can be defined as the weighted sum of all of the control points in the patch:

$$Q(u,v) = \sum_{i=0}^{3}\sum_{j=0}^{3} P_{ij}B_i(u)B_j(v)$$

Bezier Surface Patches



Demo

THANKS