Triangle Meshes

compose all objects

Models are made in programs like Blender or from laser scans into a computer.

Open GL primitives

lines
points
triangles - list vertices in counter clockwise order (probly)

triangle strip - put one more point 8 two triangles

triangle fan - all points come back to V

quads
quad strips

polygons}
generally these days use triangles

biggest point: direction matters and will mess things up

Convex

\[ \Delta \square \circ \]

Concave

\[ \nabla \n\]

Computer cannot split these into triangles.
Pixels

What if an edge goes through a point?
(pixel representation)

Test
Shadow representation

Top left Rasterization Test

Pixel if is on top/left it doesn't get turned on, bottom right does.

Prevents overlapping!

Triangle Normals

Unit normal vector

\[ a = v_2 - v_1, \quad b = v_3 - v_1, \quad n = \frac{a \times b}{||a \times b||} \]

(clockwise means -n)

Every vertex has a normal
give same normal to all 3 vertices, there will be face normal.

The normal is a key component to lighting

Magnitude Square all components then take the sqrt root

\[ \sqrt{(1, 0, 0) \cdot (0, 1, 0) \cdot (0, 0, -1)} = \frac{1 \cdot 1 - 1}{\sqrt{3}} \]

In emacs this is the "normal mapping"

Top left role (lines)
Continuity

$C^0$: no breaks, gaps, holes
$C^1$: tangent at joint has same direction

Spline - smooth curve defined by control points

Linear Interpolation
Change linearly from one value to another (connect the dots)

Bilinear Interpolation

What's this value?

2 interpolations will tell us