Labs APM B349 or B432
- We hope that one works at 6:00

cloud.labs.ucsd.edu - is now working.

Rendering a triangle

\[ \vec{V}_0, \vec{V}_1, \vec{V}_2 \text{ in } \mathbb{R}^3 \]

\[ \text{Viewer in } \mathbb{R}^3 \]

Smooth Shading

\[ (\frac{1}{3}, \frac{1}{3}, \frac{1}{3}) \text{ Gray} \]
Flat shading - Doesn’t average, it uses the
Value from the last vertex in
the triangle.
In the example, the whole triangle will be green.
Hidden surface algorithms -

Back faces
Culling triangles outside the field of view
Also often triangles that are too far away or too close.

Real hidden surface purpose -
Not see triangle occluded by closer triangles

1) Geometric analysis
2) Painter's Algorithm
3) Depth Buffer

- Pixels store a depth or distance value
- Typically use 32 bit integer for the depth value
- Uses a nonlinear function of distance
- Thus there are minimum/maximum distances
Transparent / Translucent triangle
- Use a hybrid of depth buffer + painters algorithm.

GL_TRIANGLE_STRIP

Vertex order:
V0, V1, V2, V3, V4, V5...

Triangles have vertices:
Vi, Vi+1, Vi+2
(Can think of it as alternating CCW, CW)
What vertex is needed to render this as a triangle strip?

- \( V_0, V_1, V_3, V_2 \)

- \( V_1, V_0, V_2 \) - Starts off clockwise \( \times \)

- \( V_2, V_3, V_1, V_0 \) - this order does work! \( \checkmark \)

- \( V_3, V_0, V_2, V_1 \) - Also works, but \( \Box \) are the triangles!
Render this as a triangle fan.

\[ V_0, V_1, V_2, V_3 \quad - \quad \text{Works!} \checkmark \]

\[ \text{Triangles } V_0, V_1, V_4 \]

\[ V_2, V_3, V_0, V_1 \quad - \quad \text{Also works. Same triangle} \]

\[ V_4, V_0, V_1, V_2, V_3 \]

\[ V_4 = \frac{V_0 + V_1 + V_2 + V_3}{4} \]
Render as 2 triangle fans:
\[ V_0, V_2, V_6, V_4, V_5, V_1, V_3, V_2 \]

or

Render as 2 triangle strips:
left-top-right \[ V_4, V_0, V_6, V_2, V_1, V_3, V_5, V_4 \]
& front-bottom-back.

\[ V_0, V_1, \ldots, V_1 \]