Z-Buffer / Perspective Issues

Remember: Transformed \( Z \) is

simple version \( Z' = n + f - \frac{fn}{z} \)

\[
\begin{align*}
z &= n & z' &= n \\
z &= f & z' &= f \\
\end{align*}
\]

\[
\begin{bmatrix}
1 \\
1 \\
\frac{n+f}{n} \\
\frac{1}{n}
\end{bmatrix}
\]

\[
\begin{bmatrix}
1 \\
1 \\
\frac{n+f}{n-f} \\
\frac{-fn}{n-f}
\end{bmatrix}
\]

\( Z' = \frac{n+f}{n-f} - \frac{fn}{(n-f)z} \)

in book negative since we look down the \(-z\) axis

Field of View vs. Focal Length

\[ \theta \]

\( \text{gluPerspective ( foey, aspect, near, far)} \)
Z-Buffer Issues

- Precision of Z - historically fixed point
  - can't be $-\infty$ to $\infty$
  - instead near -> far
  - since we're storing $\alpha \sim 1 - \frac{1}{Z}$
  - not uniformly spaced - want n-f to be small

- order independent?
  - usually
  - if $z = \left \text{last (or first) drawn wins} \right$
  - if $z$ close? rounding error may make =
  - Z-Fighting (flicker as things move)

  transparency

  performance / overdraw
Shading / BRDF
- recap
  - emphasize independent of transport
    complex model \leftrightarrow primitive
    simple model \leftrightarrow fancy global transport

Triangles
  Gouraud
  Phong
  Shaders

OpenGL
  State Model
    glBegin
    Normal
    Vertex

What does glColor do?
Material Model
Lighting Setup

Transforms
  Lighting (must be after transforms)
Drawing