Coordinate systems & Viewing, Rendering Polygonal Objects
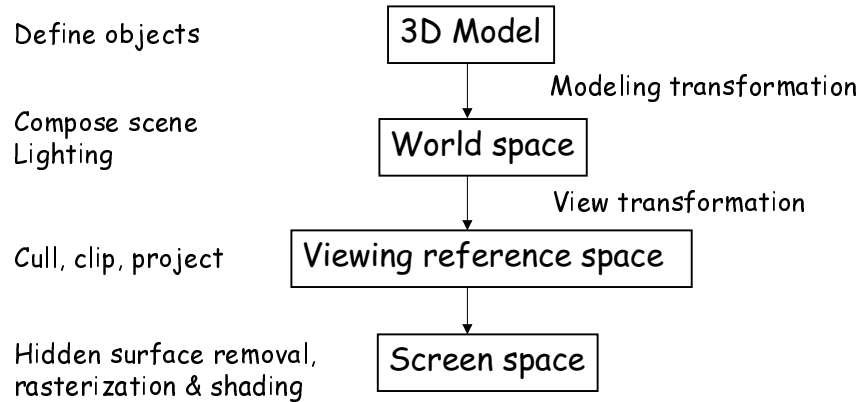
Thoughts on A2

❚ Remember: all drawing in display routine
❚ How to draw each object
  ❚ Polygon, mesh
  ❚ "shapes package"
  ❚ "unit cube" …
❚ Lighting is a special case
  ❚ OpenGL is <u>immediate</u> mode

3D viewing process

Define objects

3D Model

Modeling transformation

Compose scene
Lighting

World space

View transformation

Cull, clip, project

Viewing reference space

Hidden surface removal,
rasterization & shading

Screen space

ViewSpace

▮ Backface culling
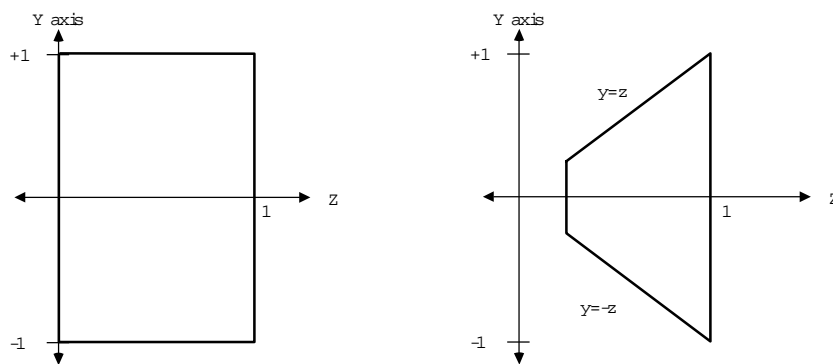
▮ Clip

▮ Project

Backface culling

Perspective View Volume (fig 5.6)

ScreenSpace

- Hidden surface removal (z-buffering) and rendering (rasterization+shading)
- Done in a "canonical volume"
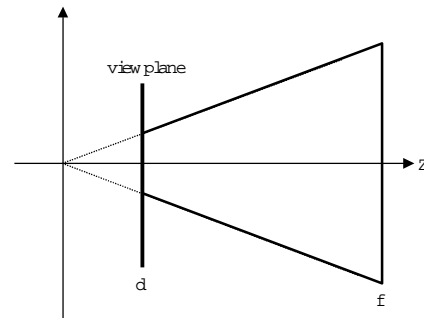 - Simplifies rendering

Canonical View Volumes

Projections

▌ 3D points project onto view plane where projector (line to COP) intersects VP
▌ Perspective Proj.
  ▌ COP in world
▌ Parallel Proj.
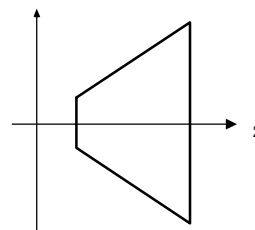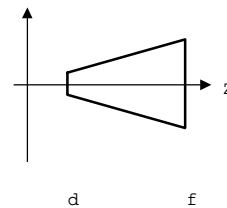 ▌ COP at infinity

The resulting view volumes

▌ Parallel
  ▌ Infinite parallelpiped
▌ Perspective
  ▌ Semi-infinite pyramid

▌ Limit them
  ▌ Front and back clipping planes

Defining the Perspective View
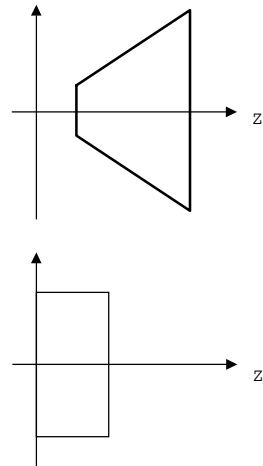

Simple Perspective Transform

1) Scale sides to 45 degrees

Simple Perspective Transform

2) Map to canonical parallel
   volume

Composite Matrix

Z accuracy over [0..1]

- $z_s = (f (1-d/z_v)) / (f-d)$