Planar Geometric Projection

- Projectors are straight lines

- Projection surface is a plane (picture plane, projection plane)

This drawing itself is a perspective projection
Main Classes of Planar Geometrical Projections

a) Perspective: determined by Center of Projection (COP) (in our diagrams the “eye”)

b) Parallel: determined by Direction of Projection (DOP) (projectors are parallel—do not converge to an “eye” or COP)

• In general, a projection is determined by where you place the projection plane relative to principal axes of object, and what angle the projectors make with the projection plane
• Parallel projections used for engineering and architecture because they can be used for measurements
• Perspective imitates our eyes or a camera and looks more natural
Multiview Orthographic

• Used for:
  – engineering drawings of machines, machine parts
  – working architectural drawings

• Pros:
  – accurate measurement possible
  – all views are at same scale

• Cons:
  – does not provide “realistic” view or sense of 3D form

• Usually need multiple views to get a three-dimensional feeling for object
Perspective Projections

- Used for:
  - advertising
  - presentation drawings for architecture, industrial design, engineering
  - fine art

- Pros:
  - gives a realistic view and feeling for three dimensional form of object

- Cons:
  - does not preserve shape of object or scale (except where object intersects projection plane)

- Different from a parallel projection because
  - parallel lines not parallel to the projection plane converge
  - size of object is diminished with distance
  - foreshortening is not uniform
Vanishing Points (1/2)

- For right-angled forms whose face normals are perpendicular to the $x$, $y$, $z$ coordinate axes, the number of vanishing points = number of principal coordinate axes intersected by projection plane

**One Point Perspective**  
(z-axis vanishing point)

**Two Point Perspective**  
(z, and $x$-axis vanishing points)

**Three Point Perspective**  
(z, $x$, and $y$-axis vanishing points)