

What is “Perspective?”

- A mechanism for portraying 3D in 2D
- “True Perspective” corresponds to projection onto a plane
- “True Perspective” corresponds to an ideal camera image

ViewTransformations

- 3D world
 - Determine 3D camera viewpoint and orientation
 - Project 3D to 2D
 - Map 2D representation to physical device

(Go to notes and continue to next slide)

ViewTransformations

- Viewport

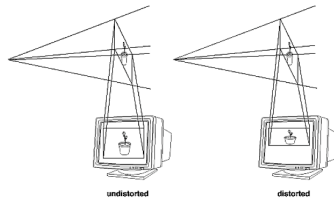


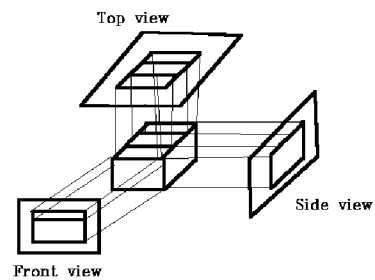
Figure 3-17 : Mapping the Viewing Volume to the Viewport

Positioning the Camera

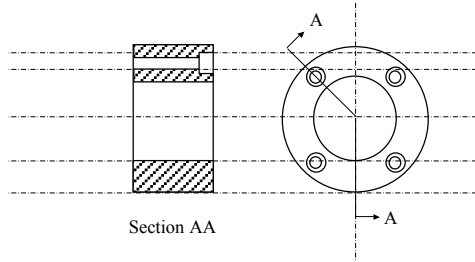
- Use `gluLookAt` to specify
 - Eye location
 - “Look-at” point
 - “up” vector
- `gluLookAt(10,10,10,1,2,3,0,0,1);`
 - Eye is (10,10,10)
 - Look at point is (1,2,3)
 - Up is (0,0,1)
- Usually done in `GL_PROJECTION` matrix and combined with perspective matrix

3D Viewing Projections

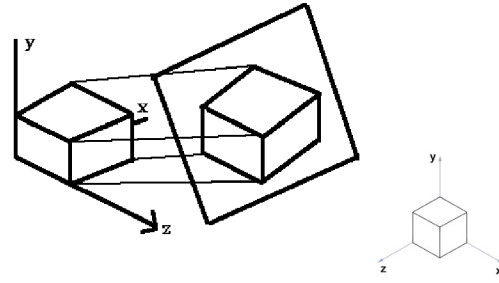
Orthographic



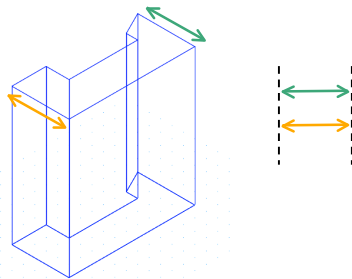
Engineering Drawing



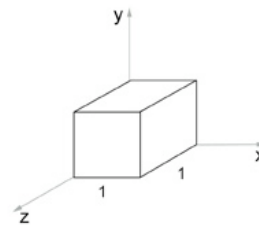
Isometric Projection



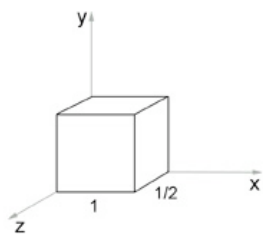
Isometric View



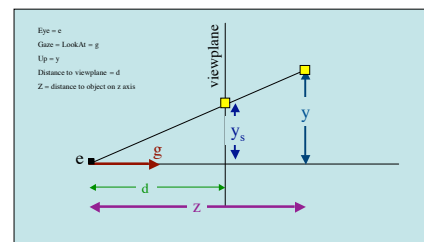
Cavalier Projection



Cabinet Projection



Perspective Projection



Frustum

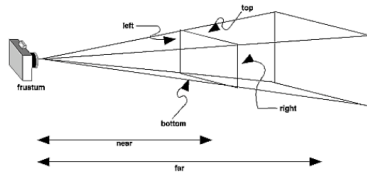


Figure 3-13 : Perspective Viewing Volume Specified by glFrustum()

Perspective

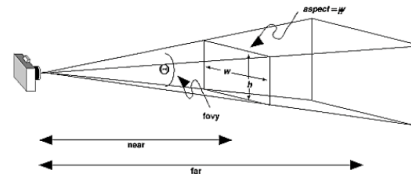
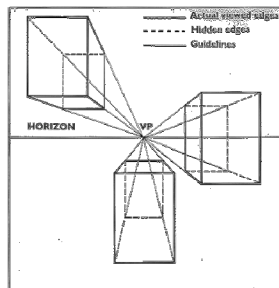
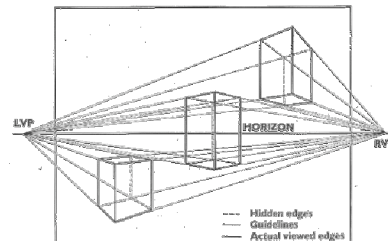


Figure 3-14 : Perspective Viewing Volume Specified by gluPerspective()

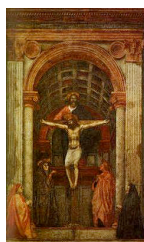
Vanishing Points: One Point Perspective



Vanishing Points: Two Point Perspective



Perspective in Art



First ever painting (Trinity with the Virgin, St. John and Donors) done in perspective by Masaccio, in 1427.

Perspective in Art



A painting (The Piazza of St. Mark, Venice) done by Canaletto in 1735-45 in one-point perspective.

Perspective in Art



Painting in two point perspective by Edward Hopper
The Mansard Roof 1923; Watercolor on paper,
13 3/4 x 19 inches; The Brooklyn Museum, New York

Perspective in Art



A painting (City Night, 1926) by Georgia O'Keefe.
Approximately in three-point perspective.

Many Kinds of Perspective Used

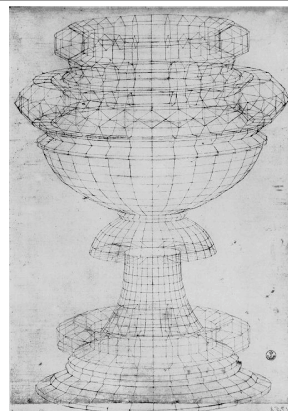
- Mechanical Engineering
- Cartography
- Art

Perspective in Art

- Naïve (wrong)
- Egyptian
- Cubist (unrealistic)
- Esher
- Miro
- Matisse

Egyptian Frontalism

- Head profile
- Body front
- Eyes full
- Rigid style



Uccello's (1392-1475) handdrawing was the first extant complex geometrical form rendered according to the laws of linear perspective (Perspective Study of a Chalice, Drawing, Gabinetto dei Disegni, Uffizi, Florence, ca 1430 1440)

24

Perspective in Cubism

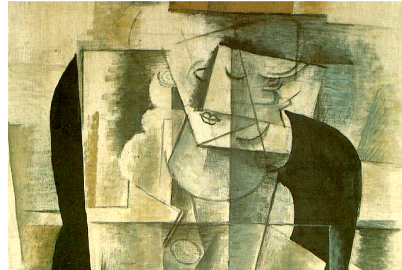


Braque,
Georges

Woman
with a
Guitar

Sorgues,
autumn
1913

Perspective in Cubism



Pablo Picasso,
Madre con niño
muerto (1937)

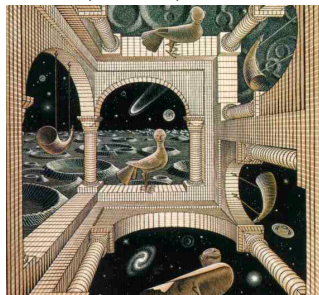
27



Pablo Picasso
Cabeza de mujer
llorando con
pañuelo

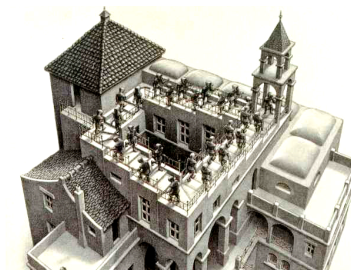
28

Perspective (Mural) Games



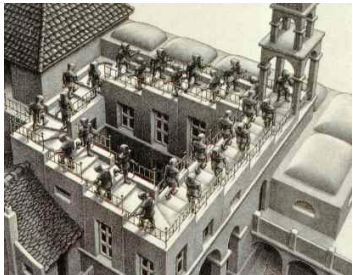
M C Escher,
Another
World II
(1947)

Perspective



M.C. Escher,
Ascending
and
Descending
(1960)

M. C. Escher

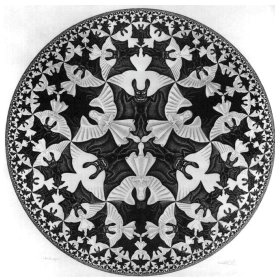


M.C. Escher,
Ascending
and
Descending
(1960)

M. C. Escher

- Perspective is “local”
- Perspective consistency is not “transitive”
- Nonplanar (hyperbolic) projection

Nonplanar Projection



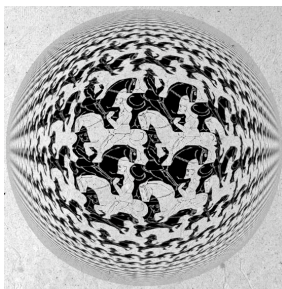
M C Escher,
Heaven and
Hell

Nonplanar Projection



M C Escher,
Heaven and
Hell

David McAllister



The March of
Progress,
(1995)

Joan Miro

The Tilled
Field

Flat
Perspective:
What cues
are missing?



Flat Perspective: What cues are missing?

Henri Matisse,
La Leçon de
Musique



37

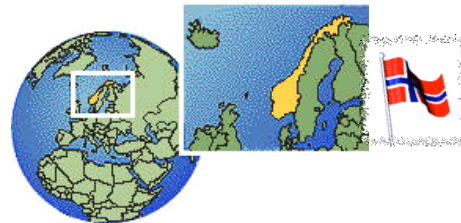


Henri Matisse, Danse II (1910)

38

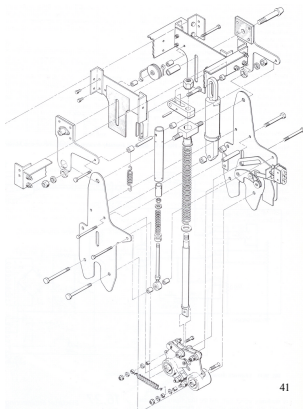


Norway is at High Latitude



Engineering Drawing: Exploded View

Understanding
3D Assembly in a
2D Medium



41

Credits

- Slides and text
 - Rich Riesenfeld's Introduction to CG slides
 - SIGGRAPH Educators Hypercard slides
 - <http://www.siggraph.org/education/materials/HyperGraph/viewing/view3d/3dprojec.htm>