3-D Display Methods

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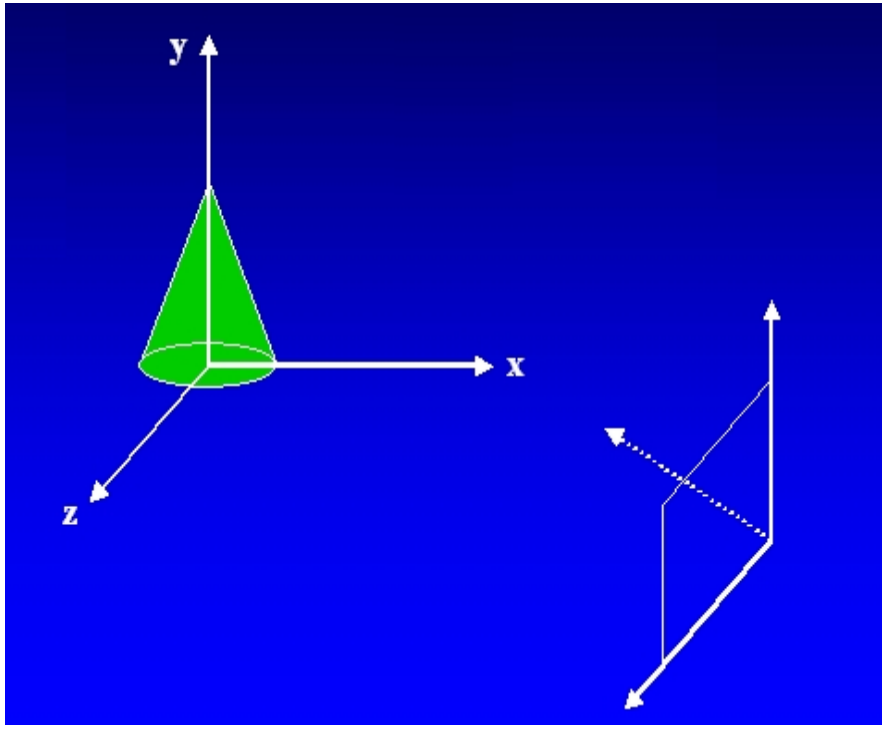
3-D Display Methods

- 3-D graphics deals with generating and displaying three dimensional objects in a two-dimensional space
  (eg: display screen).
- In addition to color and brightness, a 3-D pixels adds a depth property that indicates where the point lies on the imaginary z-axis.
- To generate realistic picture we have to first setup a coordinate reference for camera.
- This co-ordinate reference defines the position and orientation for the plane of the camera.

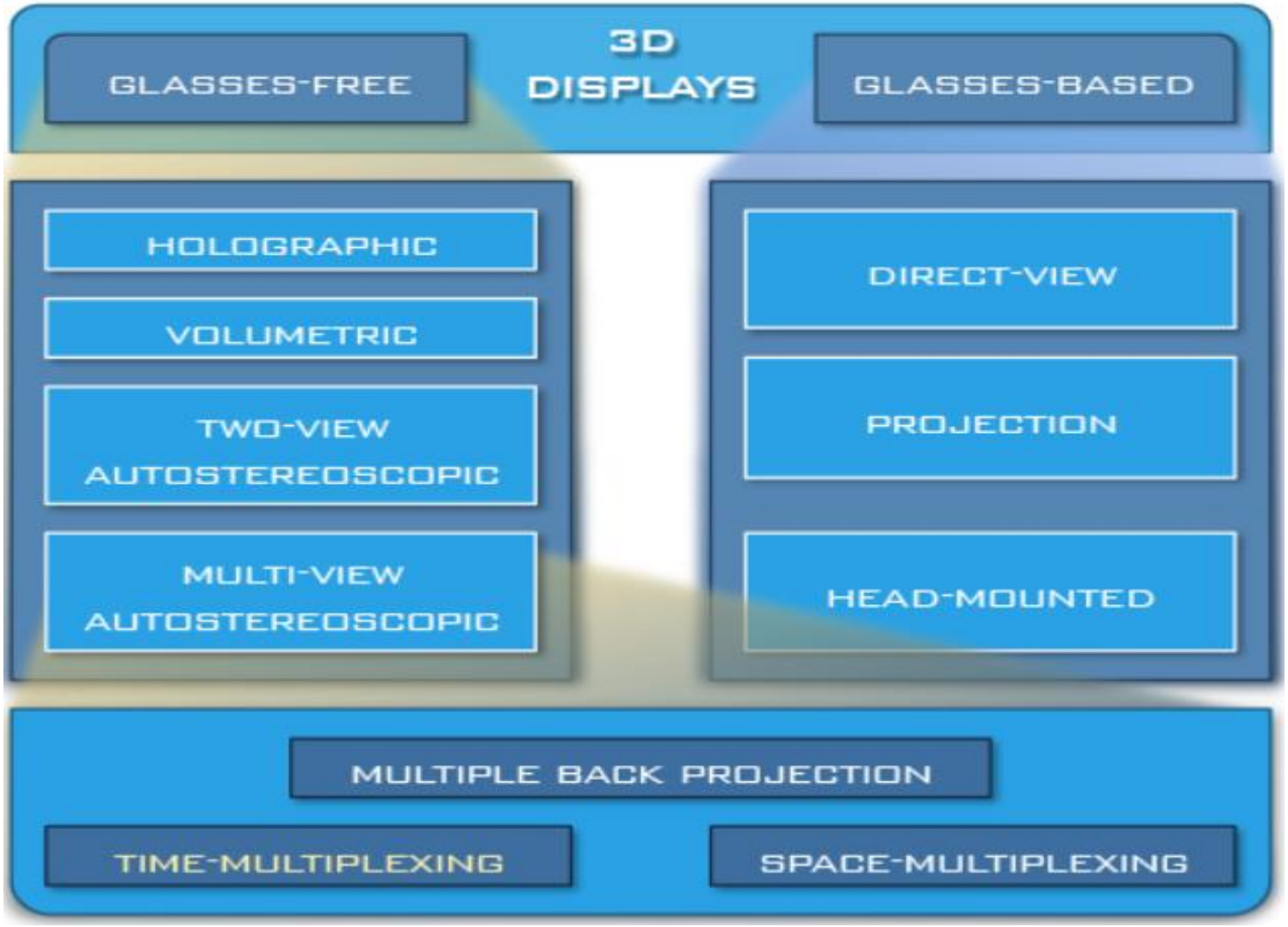
3-D Display Methods ...

•This plane used to display a view of the object

• Object description has to transfer to the camera reference co-ordinates and projected onto the selected display plane.

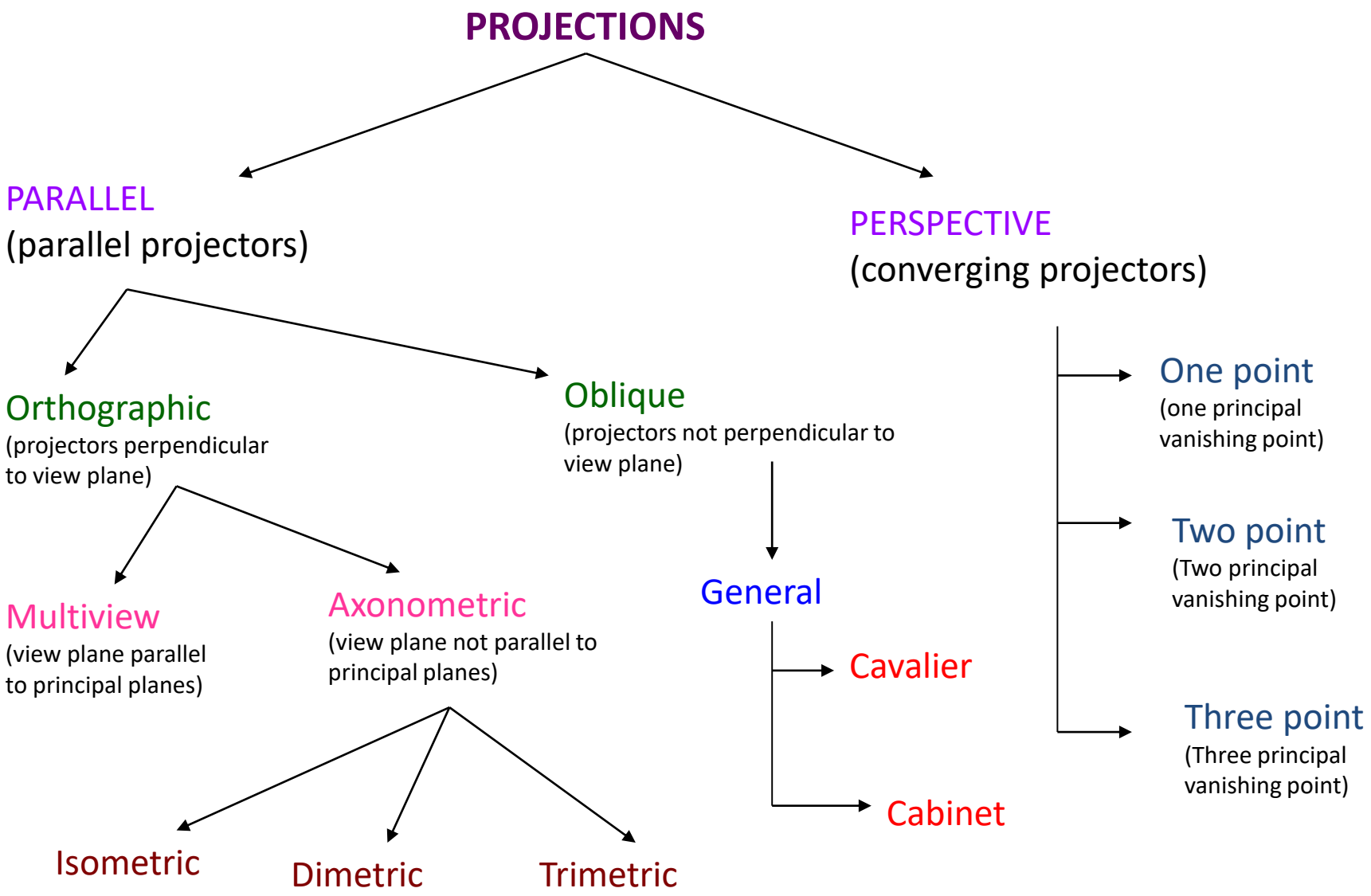


Types


3D DISPLAYS
GLASSES-FREE
GLASSES-BASED
HOLOGRAPHIC
VOLUMETRIC
TWO-VIEW AUTOSTEREOSCOPIC
MULTI-VIEW AUTOSTEREOSCOPIC
DIRECT-VIEW
PROJECTION
HEAD-MOUNTED
MULTIPLE BACK PROJECTION
TIME-MULTIPLEXING
SPACE-MULTIPLEXING

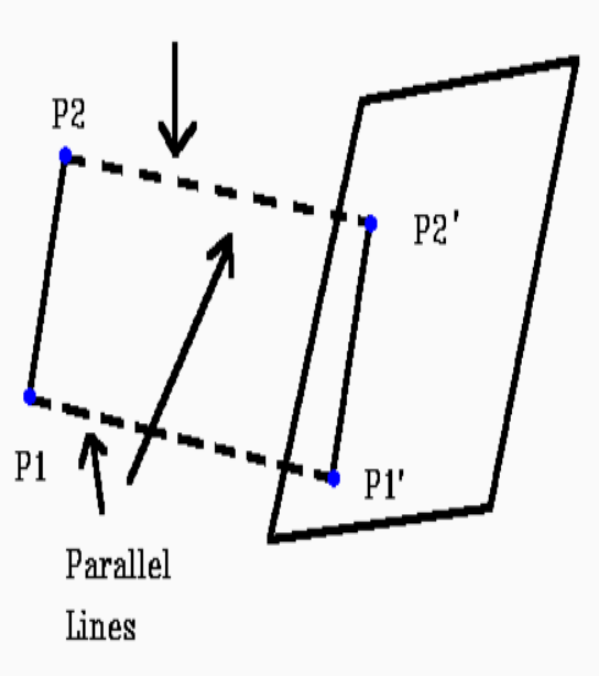
Types of Projections

- Transform 3-D objects on to a 2-D plane using projections
-
- **2 types of projections**
  - Perspective
  - Parallel


PROJECTIONS
PARALLEL
(parallel projectors)
PERSPECTIVE
(converging projectors)
Orthographic
(projectors perpendicular to view plane)
Oblique
(projectors not perpendicular to view plane)
One point
(one principal vanishing point)
Two point
(Two principal vanishing point)
Three point
(Three principal vanishing point)
Multiview
(view plane parallel to principal planes)
Axonometric
(view plane not parallel to principal planes)
General
Cavalier
Cabinet
Isometric
Dimetric
Trimetric

Parallel Projection

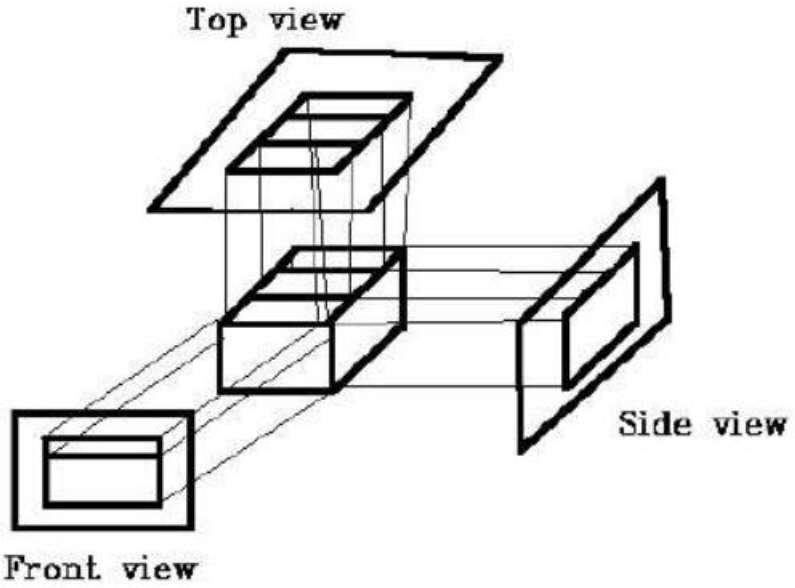
- Discards z-coordinate and parallel lines from each vertex
- Specify a direction of projection instead of center of projection
- Project points on the object surface along parallel lines onto the display plane.
- Parallel lines are still parallel after projection



Parallel Projection: Types

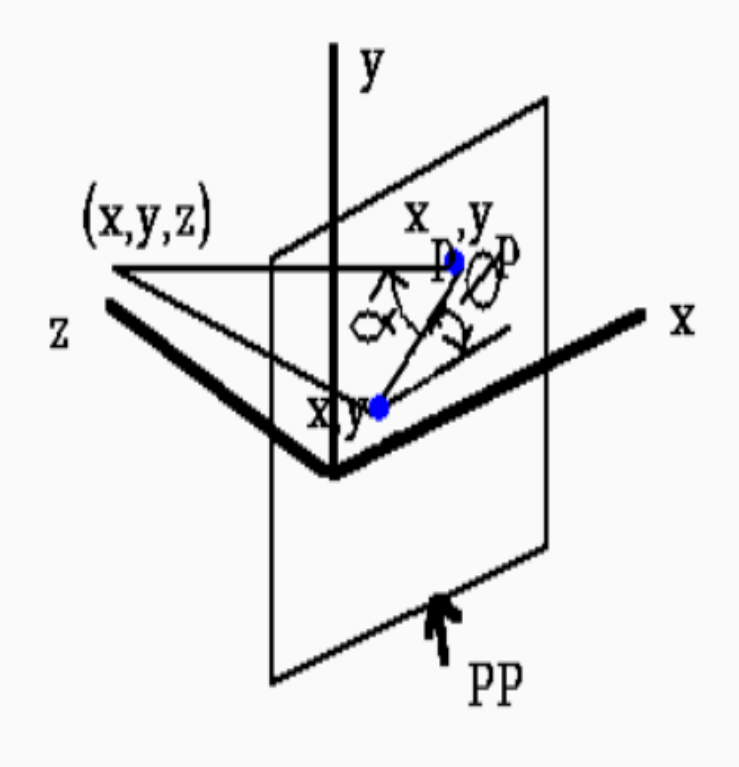
1. **Orthographic projection** :

If the direction of projection is perpendicular to the projection plane then it is an **orthographic** projection.



Parallel Projection: Types

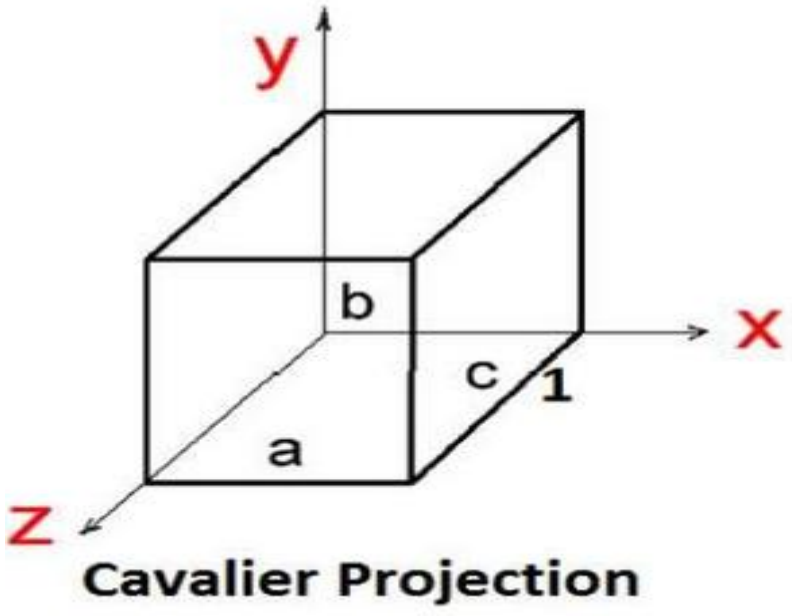
2. **Oblique projection :** If the direction of projection is not perpendicular to the projection plane then it is an **oblique** projection.



Oblique Projection: Types

➢Cavalier

- The Cavalier projection makes 45° angle with the projection plane.
- The projection of a line perpendicular to the view plane has the same length as the line itself in Cavalier projection.

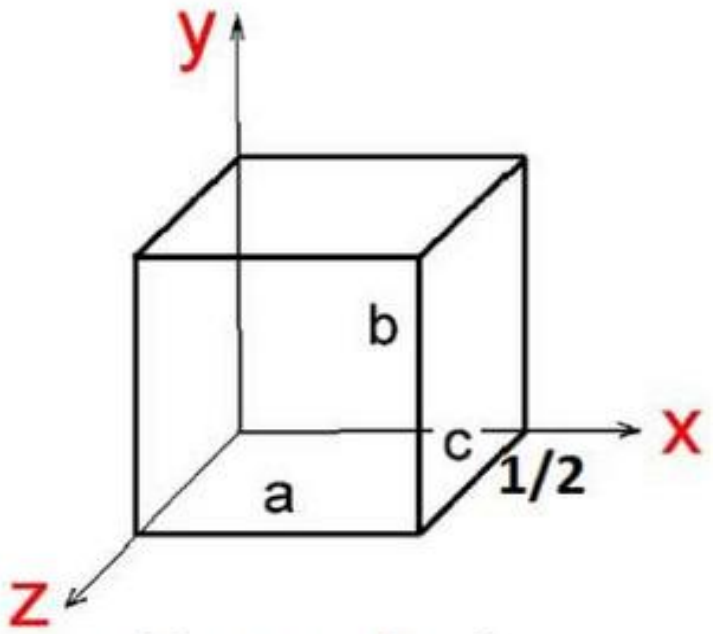


Oblique Projection: Types

- **Cabinet**

  The Cabinet projection makes 63.4° angle with the projection plane.

  In Cabinet projection, lines perpendicular to the viewing surface are projected at ½ their actual length.

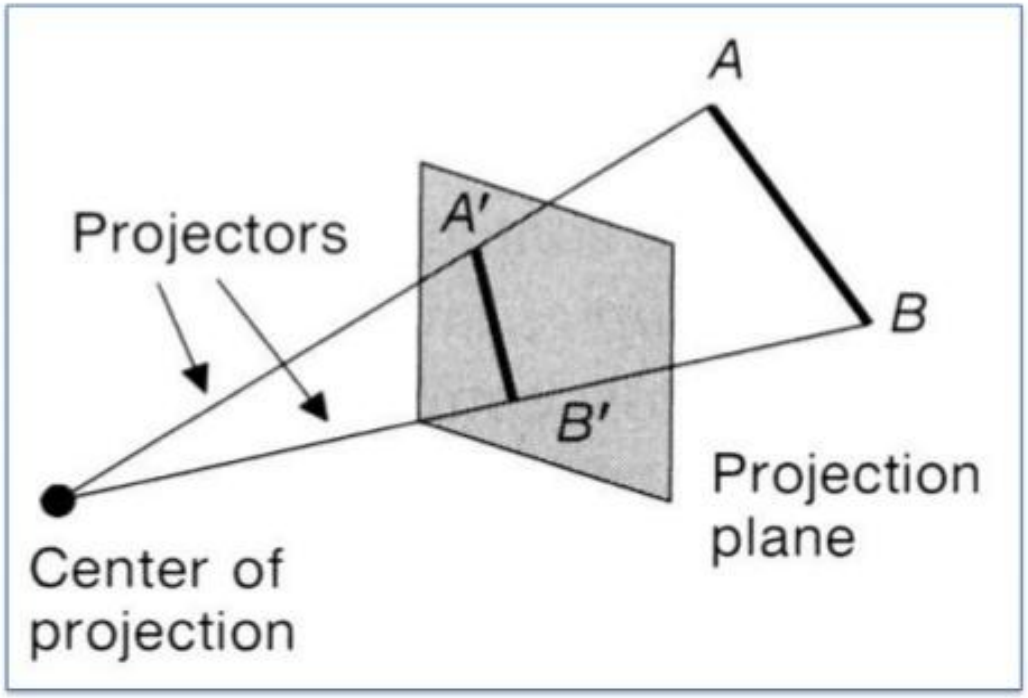


Cabinet Projection

Perspective Projection

- Project points to the display plane along converging paths.
- This is the way that our eyes and a camera lens form images and so the displays are more realistic.
- Parallel lines appear to converge to a distant point in the background.
- Distant objects appear smaller than objects closer to the viewing position.

Perspective Projection



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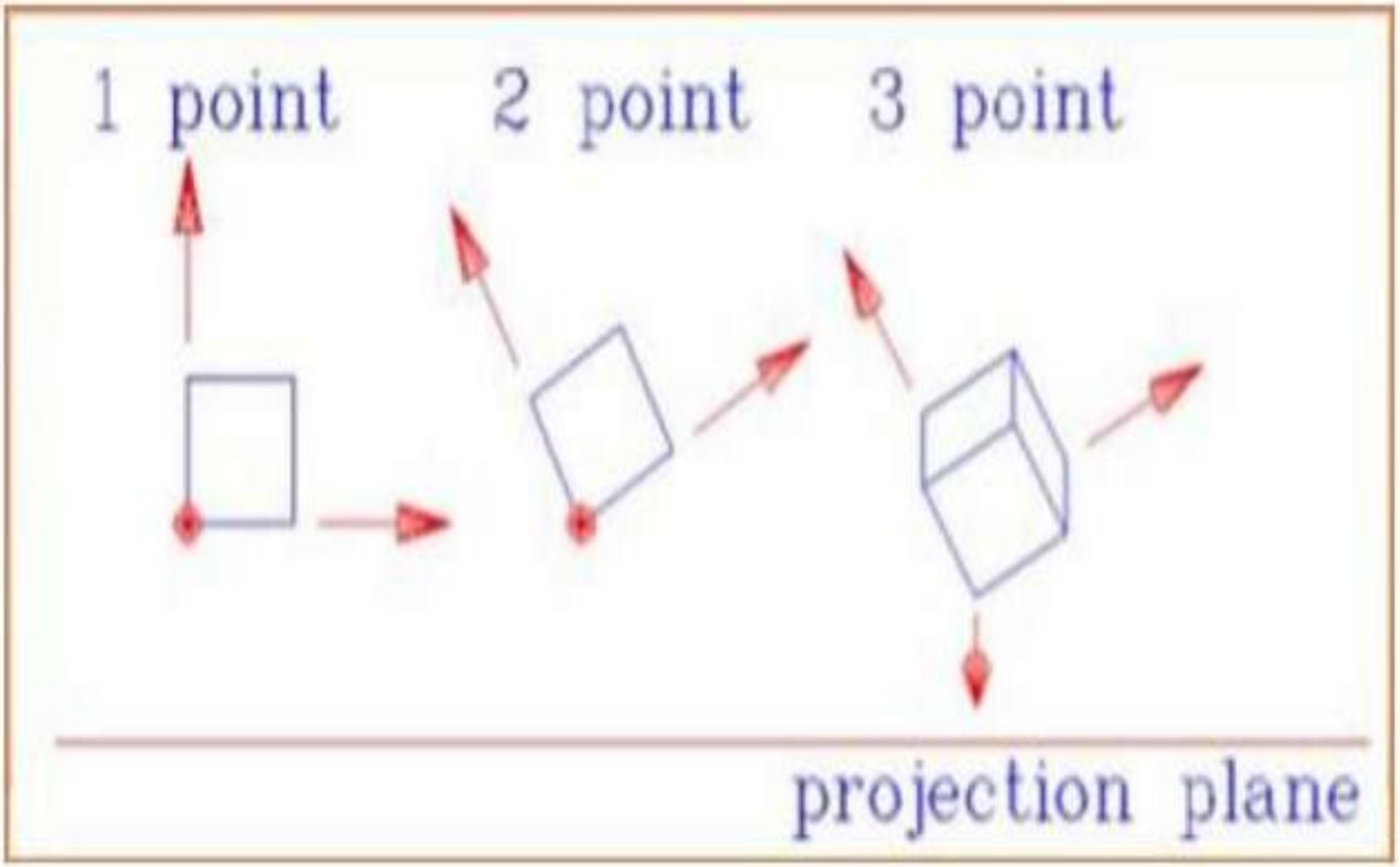
Types of Perspective Projection

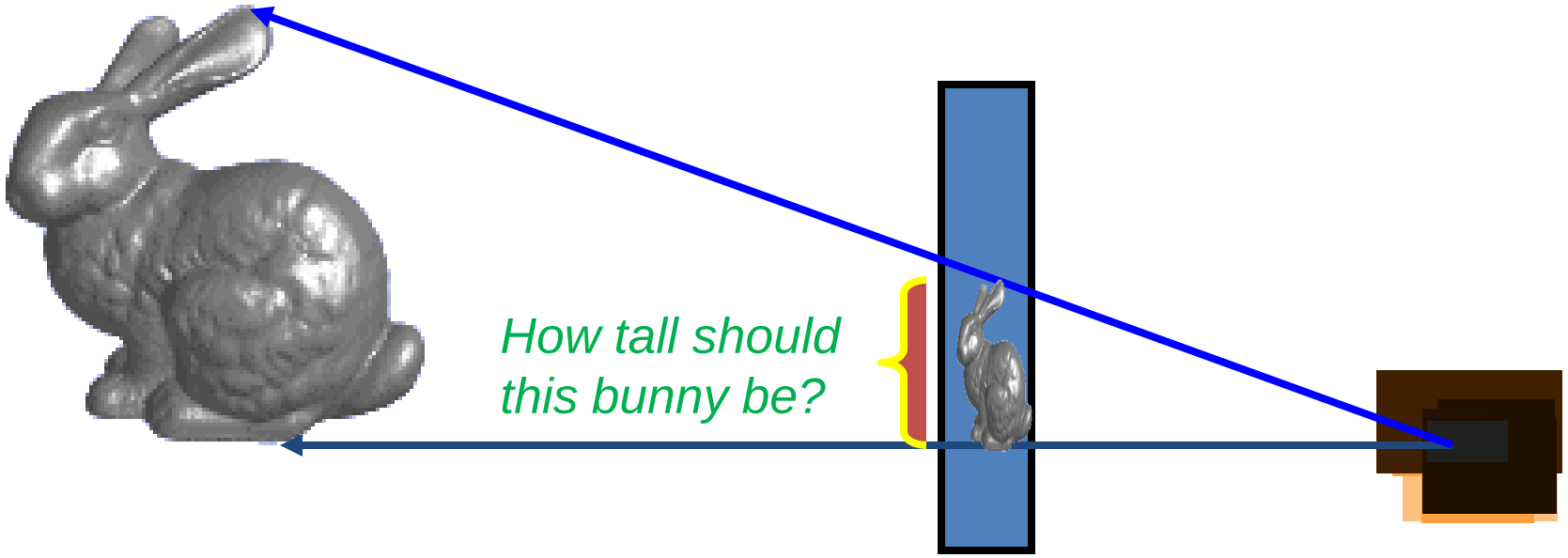
- **One point** perspective projection is simple to draw.
- **Two point** perspective projection gives better impression of depth.
- **Three point** perspective projection is most difficult to draw.

Types of Perspective Projection



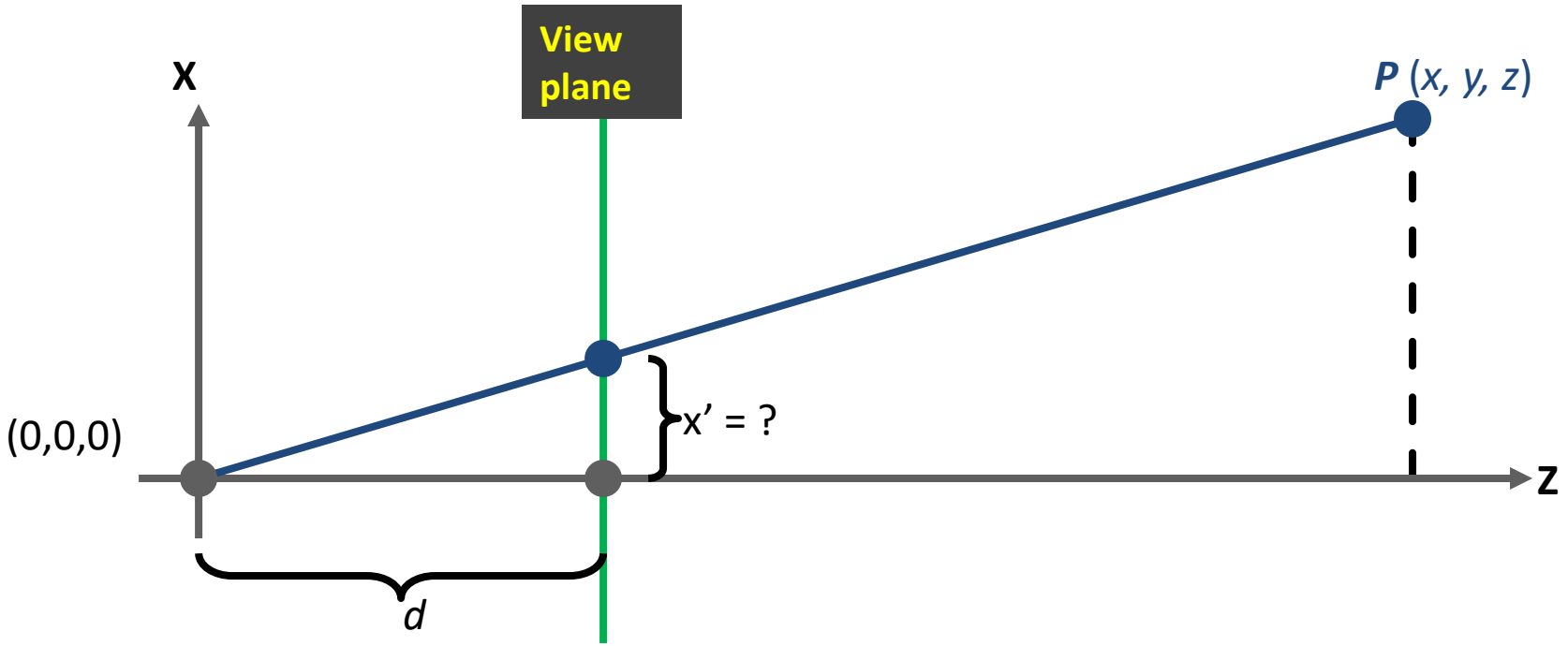
Perspective Projection

- When we do 3-D graphics, we think of the
- screen as a 2-D window onto the 3-D world:



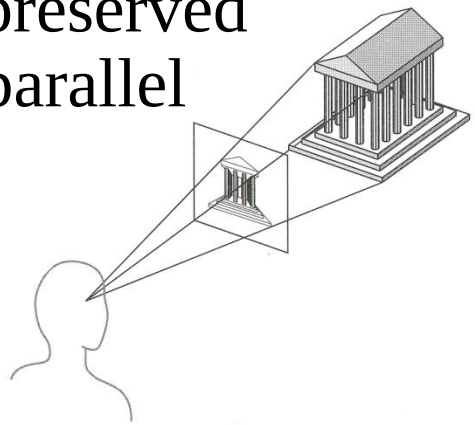
Perspective Projection

- The geometry of the situation is that of similar triangles. View from above:

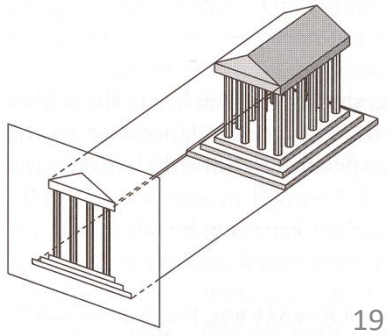


Perspective vs. Parallel Projection

- **Perspective projection**
  - Size varies inversely with distance - looks realistic
  - Distance and angles are not (in general) preserved
  - Parallel lines do not (in general) remain parallel



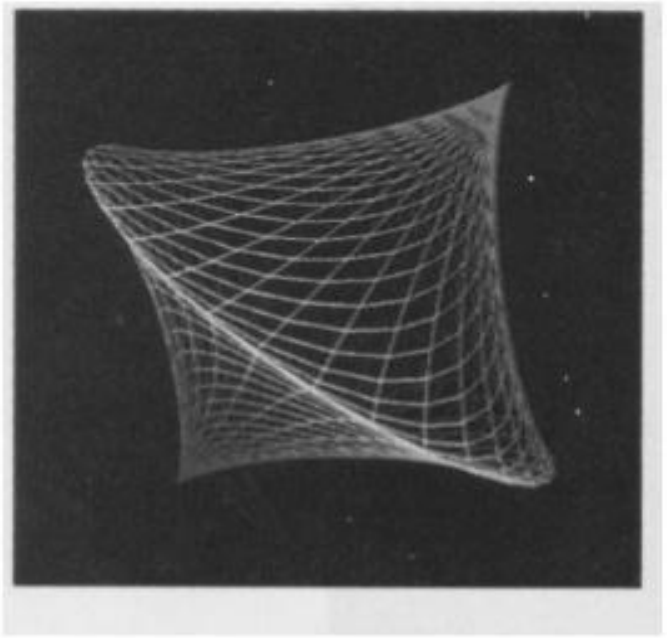
- **Parallel projection**
  - Good for exact measurements
  - Parallel lines remain parallel
  - Angles are not (in general) preserved
  - Less realistic looking



Depth Cueing

- To easily identify the front and back of display objects.
- Depth information can be included using various methods.
- A simple method to vary the intensity of objects according to their distance from the viewing position.
- eg: lines closest to the viewing position are displayed with the higher intensities and lines farther away are displayed with lower intensities.

Depth Cueing



Surface Rendering

Definition

- **Rendering** is the process of generating an image from a 2-D or 3-D model (or models in what collectively could be called a scene file) by means of computer programs.
- **Surface rendering** involves the careful collection of data on a given object in order to create a three-dimensional image of that object on a computer. It is an important technique used in a variety of industries.
- One of the techniques to construct an image using surface rendering is with illumination.

Uses of Surface Rendering

- Surface rendering is used in a number of industries, such as in health care.
- There, parts of the body are rendered so doctors can closely examine specific areas of a patient or wounds they may have incurred.
- Archaeologists also use rendering to make an image of very fragile objects in order to examine them without harming them.

Thank You