CSE4203: Computer Graphics
Chapter – 4 (part - A)
Ray Tracing

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Outline

- Projection
- Parallel projection
- Perspective projection
- Vanishing point

Projection (1/2)

- Representing a 3D object
  - Photographs also represent 3D scenes with 2D images.
- In computer graphics, **Projection** is used.

Projection (2/2)

- **3D points** are mapped to **2D image plane** by moving them along a ***projection direction***
  - *until they hit the* image plane

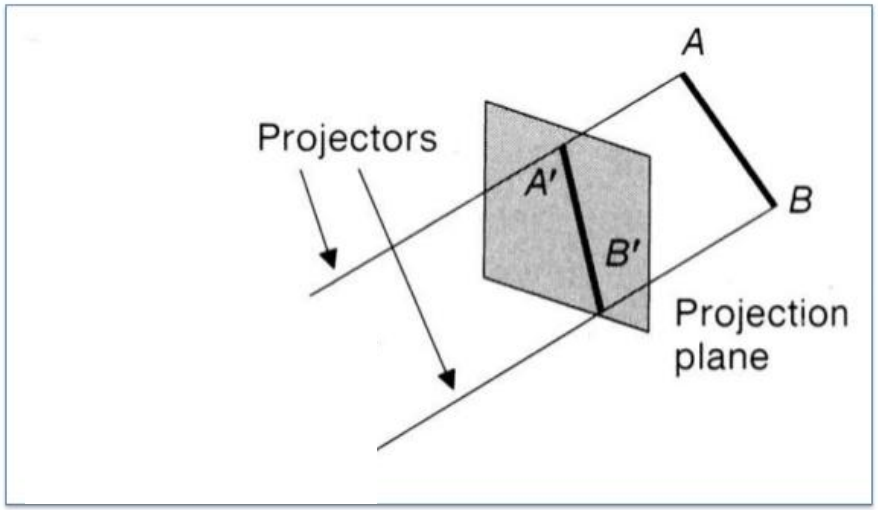
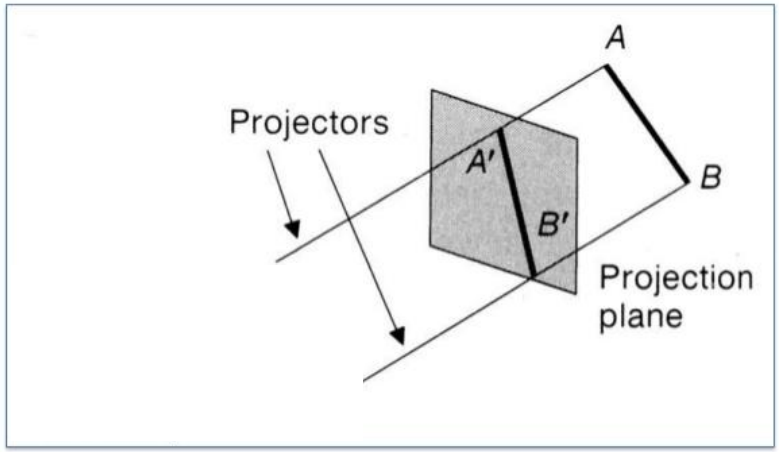


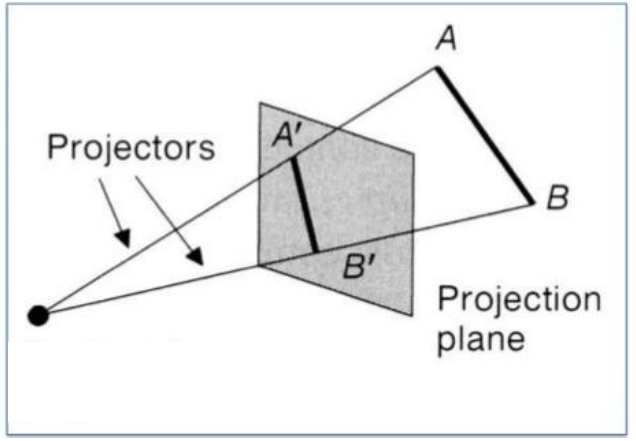
Image source: Internet

Types of Projection (1/1)

Main types:

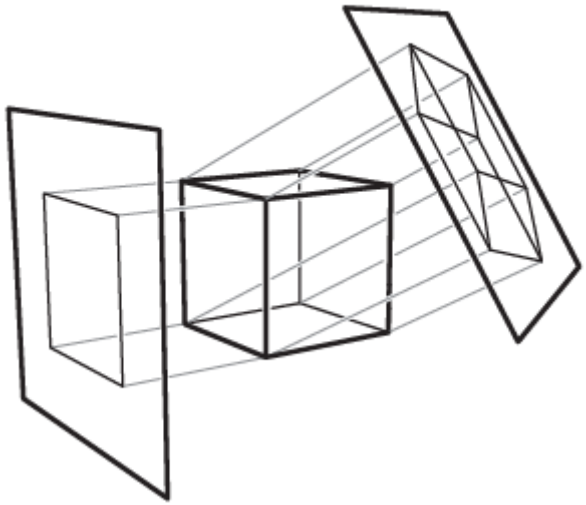
- Parallel
- Perspective





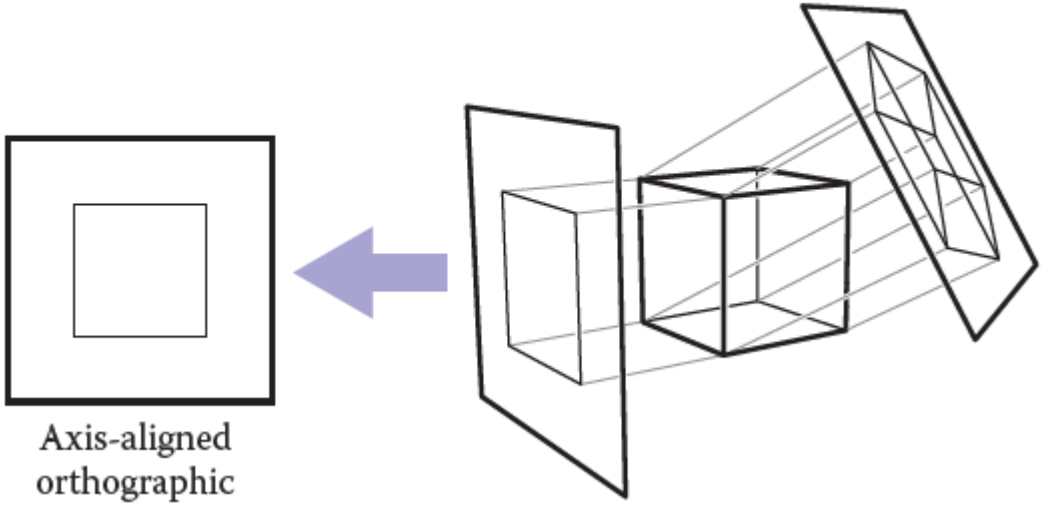
Parallel Projection (1/4)

- Projectors are parallel
  - Meet at infinity



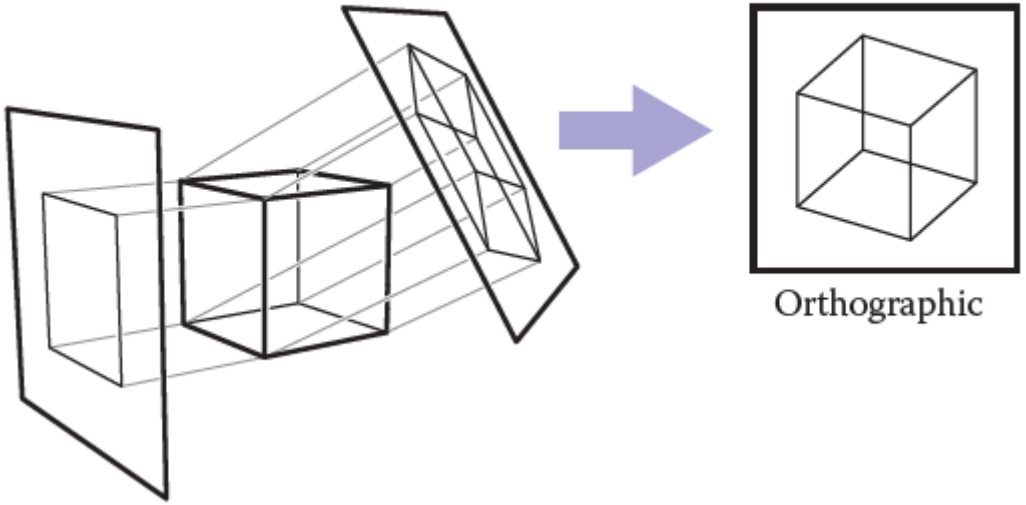
Parallel Projection (2/4)

- Orthographic



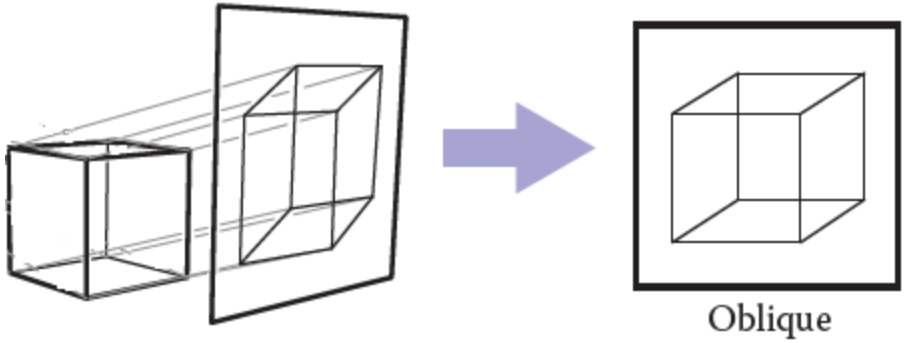
Parallel Projection (3/4)

- Orthographic
  - Image plane ⫫ projector



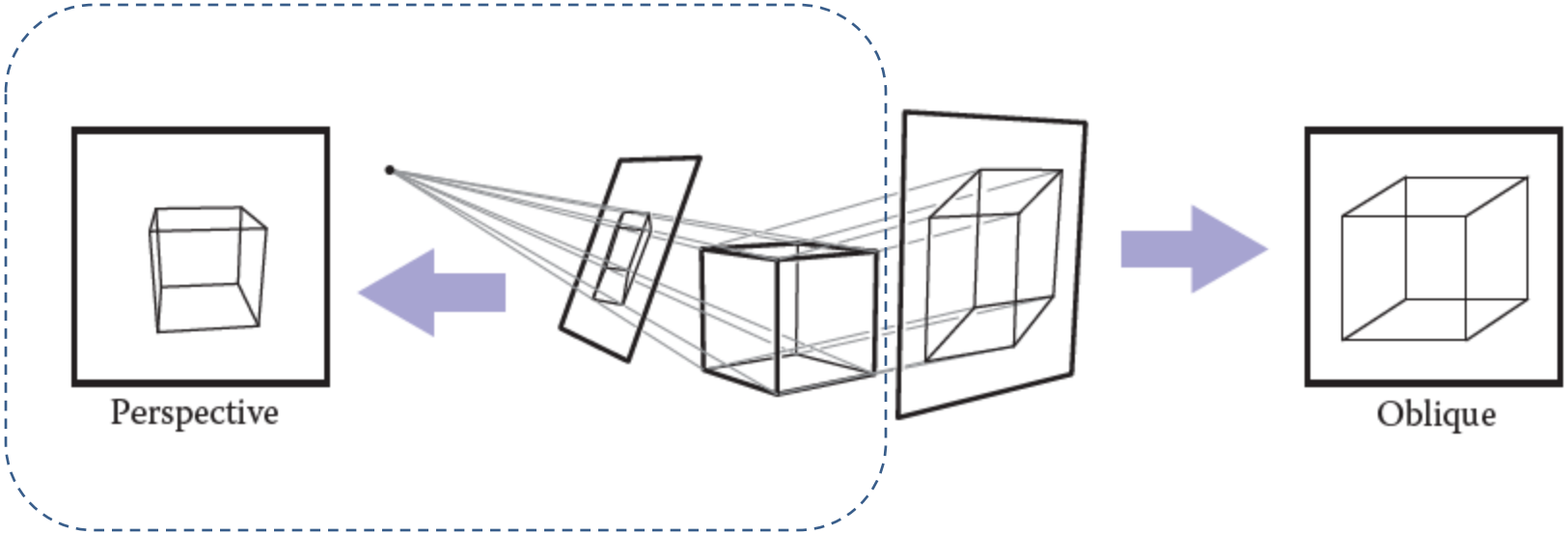
Parallel Projection (4/4)

- Oblique
  - Image plane $\not\perp$ projector

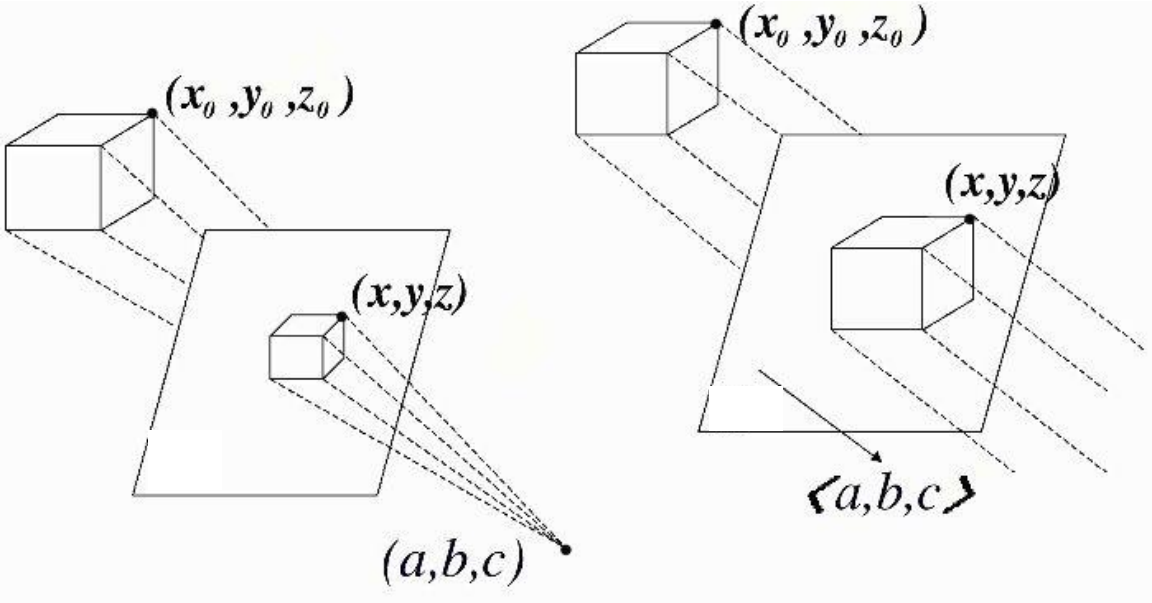


Perspective Projection (1/2)

– Projector meet at a point



Perspective Projection (2/2)



- Does parallel project have a CP?
- What will happen if the object moves near/ far?

– Play around: http://www.cs.cornell.edu/courses/cs4620/2017sp/demos/view_explore/view_explore.html

Image source: Internet

Parallel vs Perspective (1/6)

- Parallel projections are often used for –
  - mechanical and architectural drawings because they keep parallel lines parallel
    - preserve the size and shape of planar objects that are parallel to the image plane.

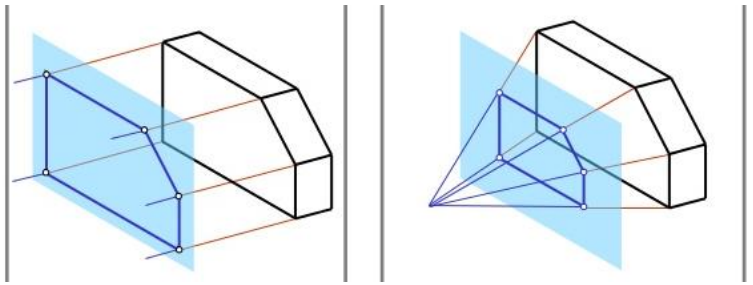


Image source: Internet

Parallel vs Perspective (2/6)

- In our everyday experience (and in photographs)
  - objects look smaller ↔ farther away

Image source: Internet

Parallel vs Perspective (3/6)

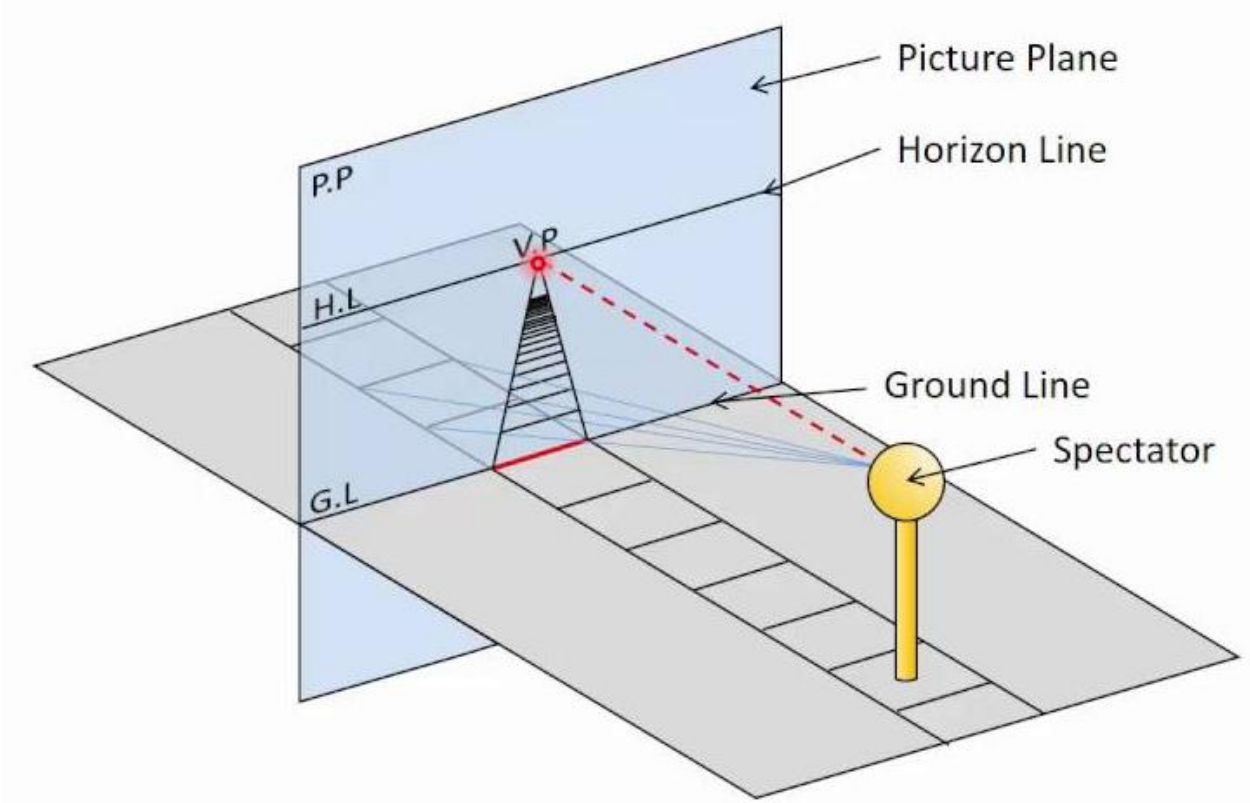
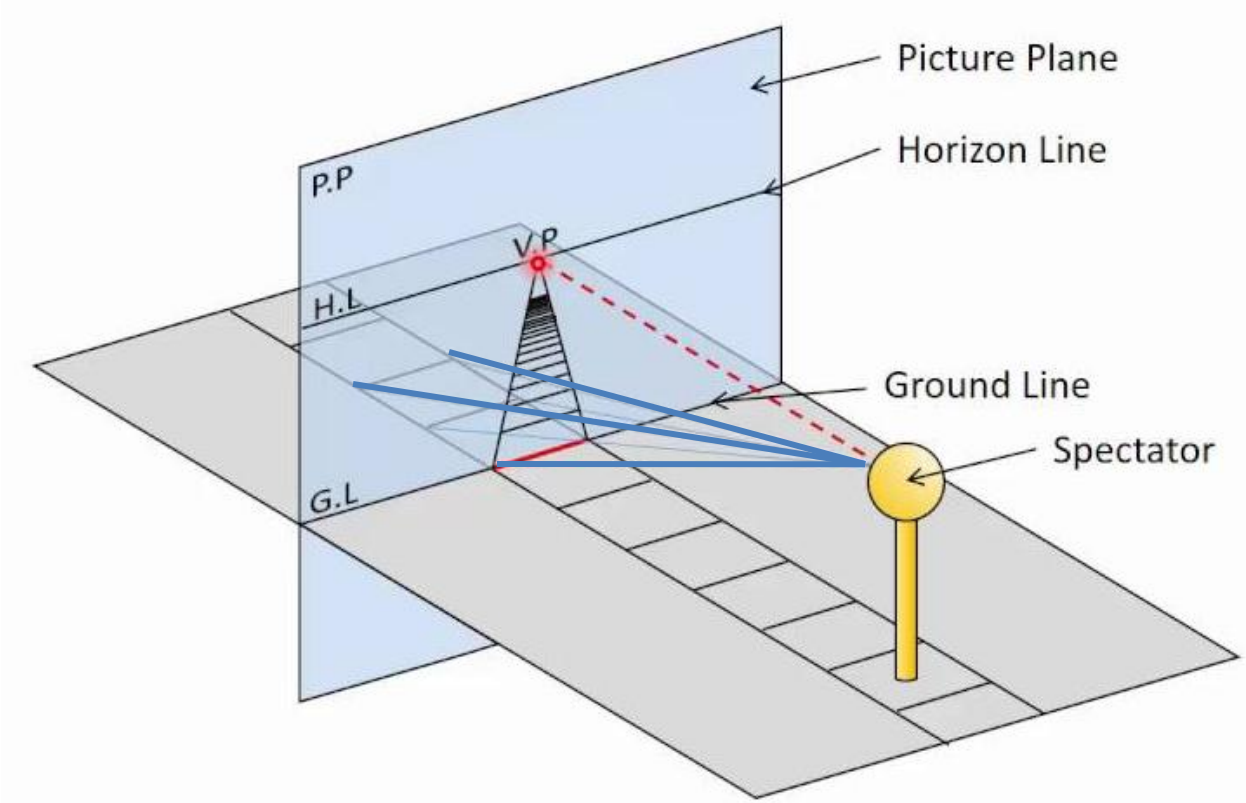
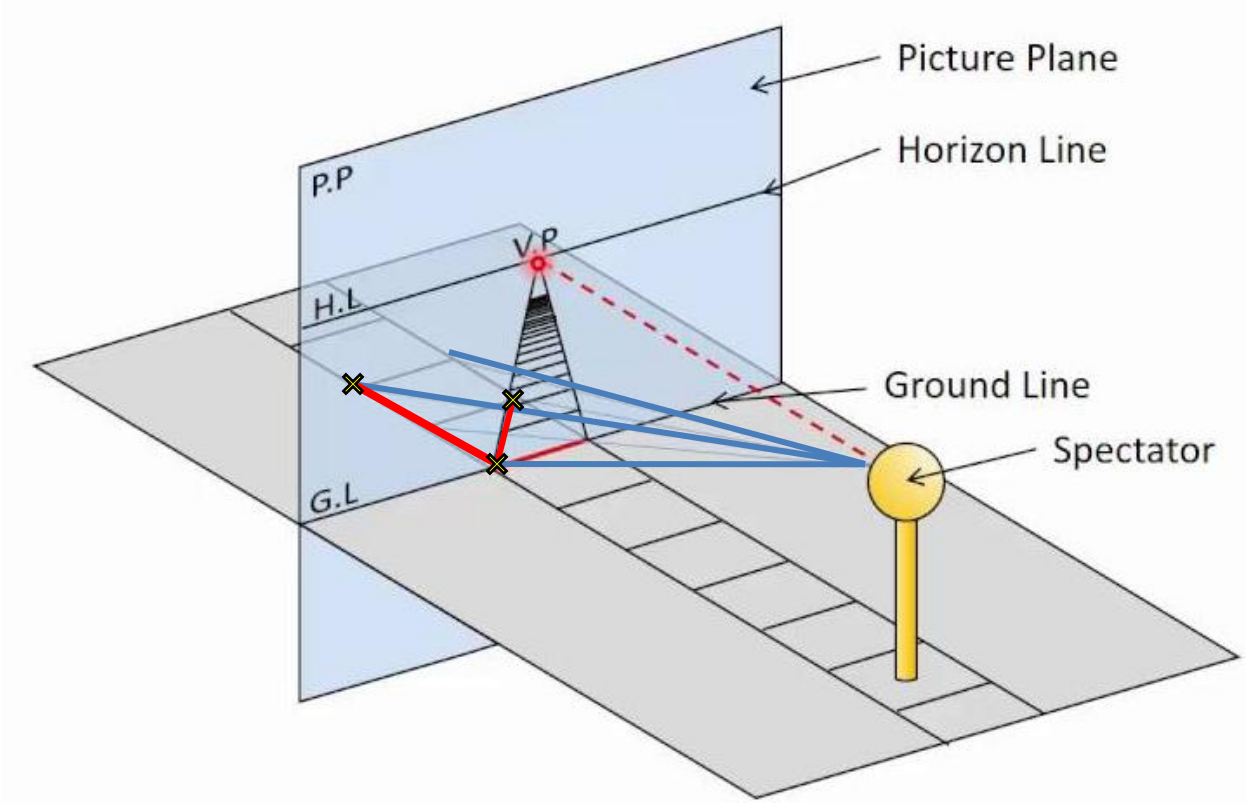


Image source: Internet

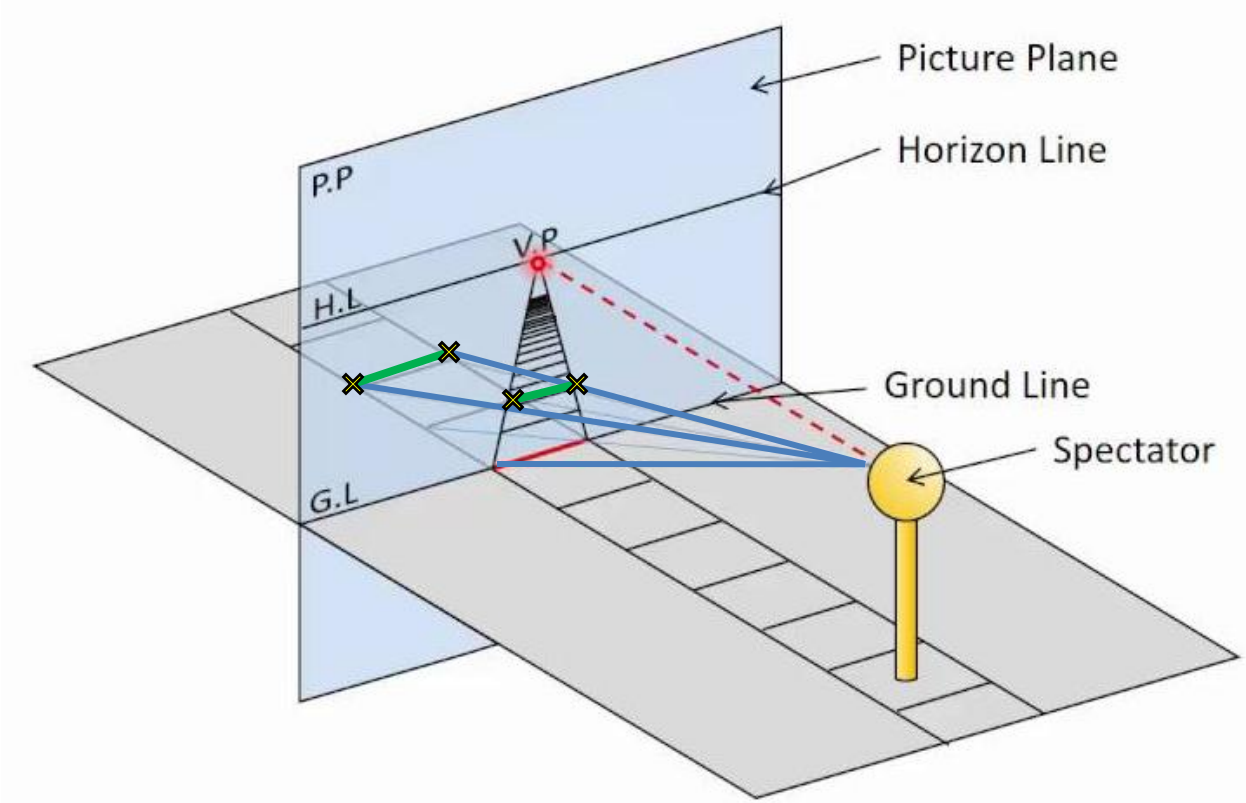
Parallel vs Perspective (4/6)



Parallel vs Perspective (5/6)



Parallel vs Perspective (6/6)



Vanishing Point (1/2)

- Vanishing points:
  - where parallel lines meet.
  - Parallel horizontal lines meet at a point on the horizon.
  - Every set of parallel lines has own VP

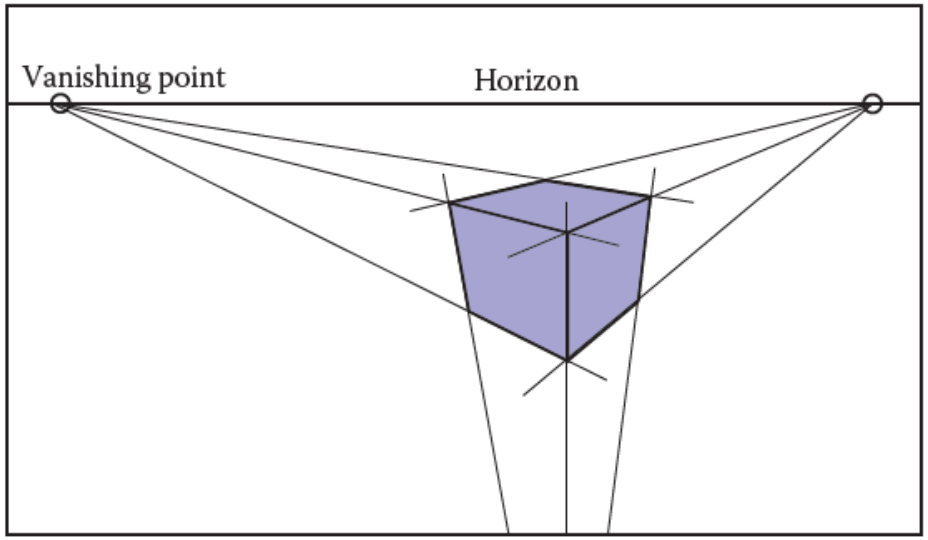
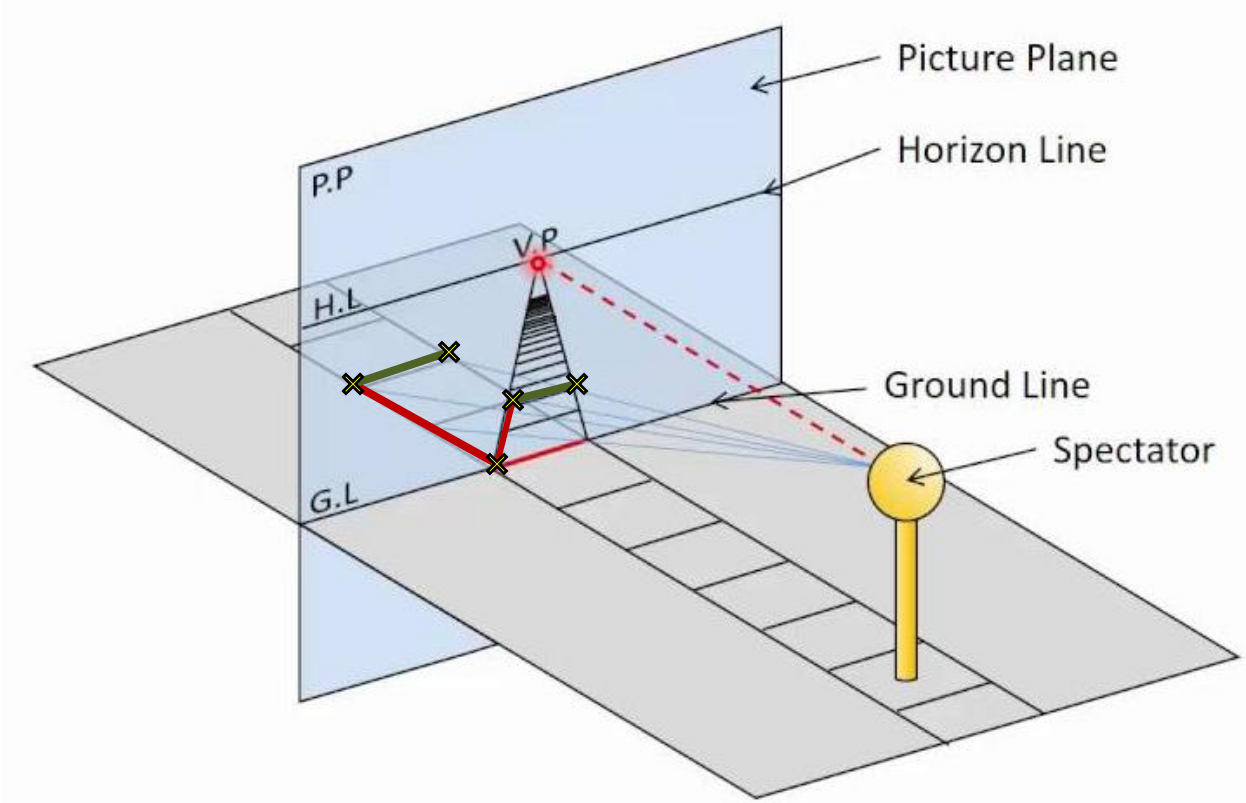


Image source: Internet

Vanishing Point (2/2)

- **Where is the VP here?**



Additional Reading

- The *three-point* perspective.

Thank You