Plane-Rays and Point Cube Maps
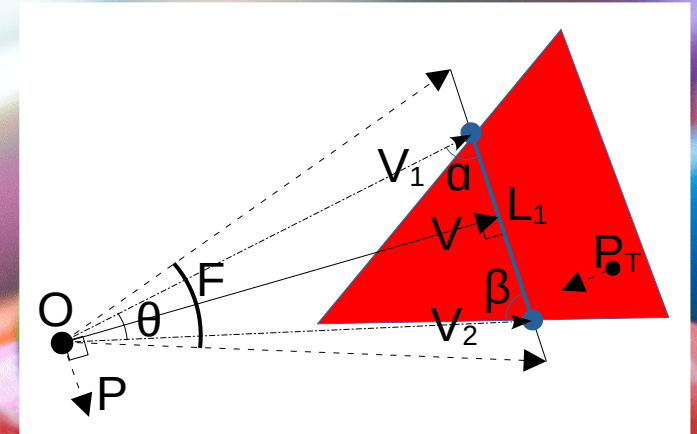
First person 3D CAD design principles

Rendering Technology Presentation

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Plane-Rays

- Definition:
  - Ray Origin, O=[x,y,z]
  - Ray Direction, V=[dx,dy,dz]
  - Ray Plane, P=[a,b,c,d]
  - Ray Field-of-View, F=[deg]

- Ray-plane triangle intersection
  - Linear angle position interpolation

$$d = -\frac{A*O_x + B*O_y + C*O_z + D}{A*V_x + B*V_y + C*V_z}$$

$$\beta_1 = 180 - a - \theta_1$$

$$L_1 = \|V_1\| \frac{\sin(\theta_1)}{\sin(\beta_1)}$$

Point Cube Maps

- Definition:
  - Surface point diffuse light accumulation
  - Spherical surface density correction
  - Above-surface and sub-surface rays

- Ray traced raster render model
  - Only surface light map reflection/refraction rays
  - No denoising required, standard raster filtering
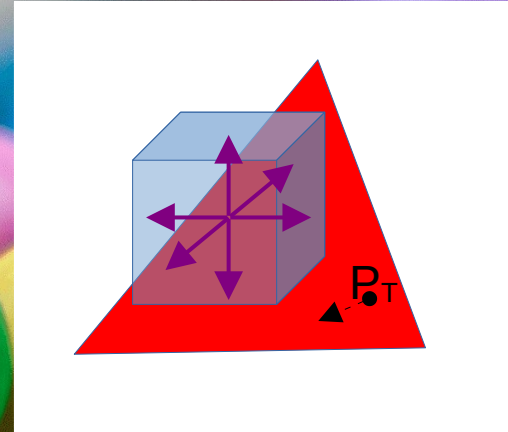
First person 3D CAD

- Definition:
  - Free camera vector edit plane with vertex snapping
  - Automatic object generation by vector connectivity
  - Controller adjusted texture and model orientation
  - Drag and drop texture and model insert into design
  - Automatic sphere/cube object boundary volume