Clipping

Image Formation

Camera Model

Synthetic Camera Model

Is the Eye, Lookat and Up Vector enough to define the camera?

The field of view (ө) is also needed along with the window aspect ratio (w/h).

What if the window is shifted?
Synthetic Camera Model

Y

Z

Eye

Lookat

Up Vector

Camera Demo

If the window is shifted the scene gets clipped at the window edges.

Line Clipping

• Divide the plane into 9 regions.
• Each region has its own 4 bit outcode.
• Compute the outcodes OC₀ and OC₁ for the vertices of the line segment.
• Trivially accept if OC₀ OR OC₁ = 0 (TA)
• Trivially reject if OC₀ AND OC₁ = 1 (TR)
• If cannot TA/TR, subdivide line into two segments at a clip edge and TA/TR one or both segments.
• Repeat until entire line has been processed.

Cohen – Sutherland Algorithm

Cline(x₀, y₀, x₁, y₁)
{
ComputeOutcode(x₀, y₀, OC₀);
ComputeOutcode(x₁, y₁, OC₁);
repeat
Check for TA and TR. If either happens then done.
Choose a vertex that is outside the clip rectangle.
if (vertex lies over TOP edge) then
x = x₀ + 1/slope * (yₘₐₓ – y₀)
y = yₘₐₓ
else if (vertex lies below BOTTOM edge) then
x = x₀ + 1/slope * (yₘᵦₘᵦ – y₀)
y = yₘᵦₘᵦ
everse if (vertex lies to right of RIGHT edge) then
y = y₁ + slope * (xₘₓₐ – x₁)
x = xₘₓₐ
else if (vertex lies to left of LEFT edge) then
y = y₁ + slope * (xₘᵦₘᵦ – x₁)
x = xₘᵦₘᵦ
until (done)
}

Read notes on Cyrus-Beck Parametric Line Clipping Algorithm.

Polygon Clipping
Polygon Clipping

Sutherland – Hodgman Algorithm

CS475/CS675 - Lecture 2