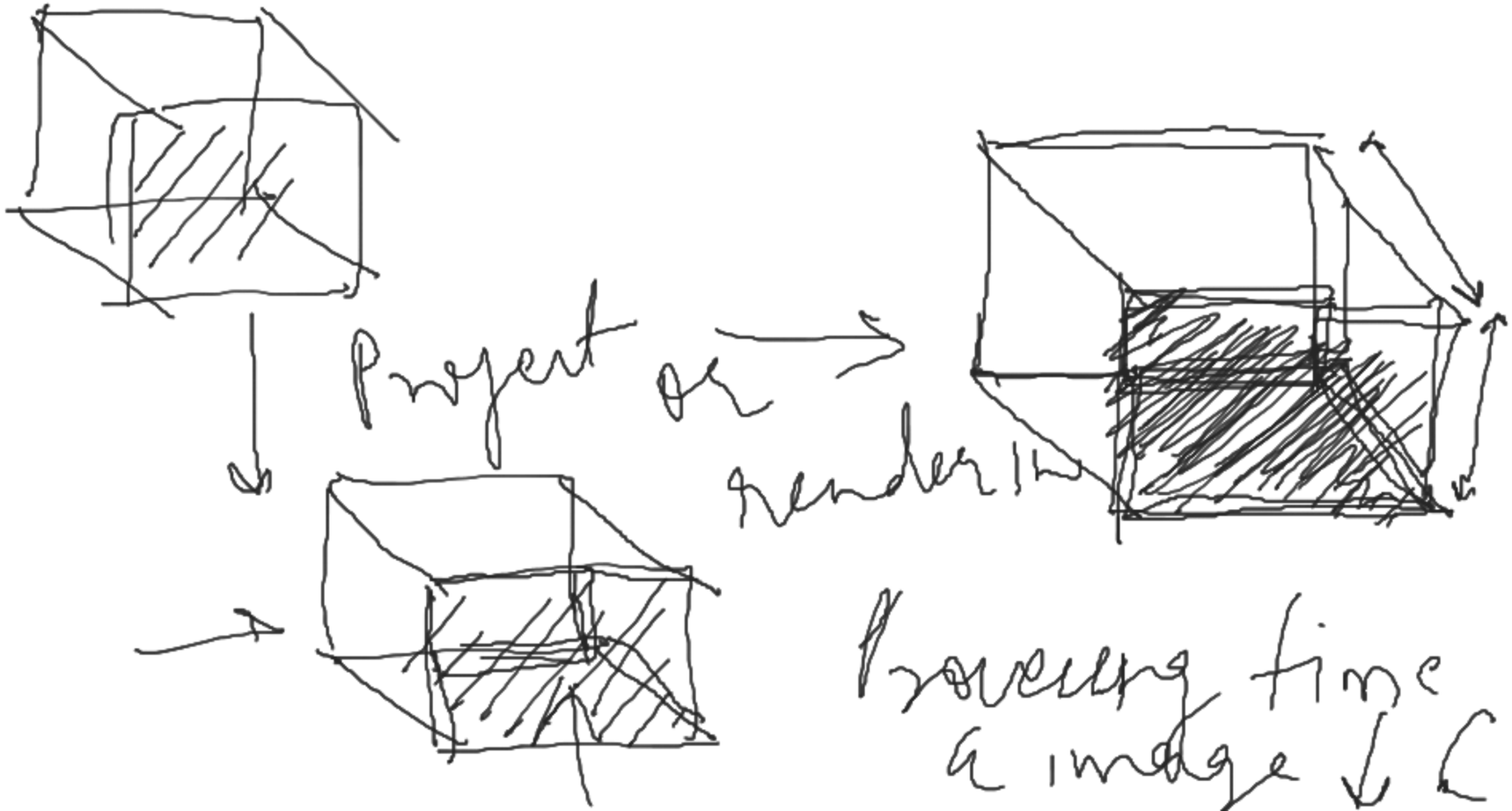
Hidden & Visible Surfaces.



Browsing time for rendering a image ↓ C

There are two approaches :-

1. Image Space Method
2. Object Space method.

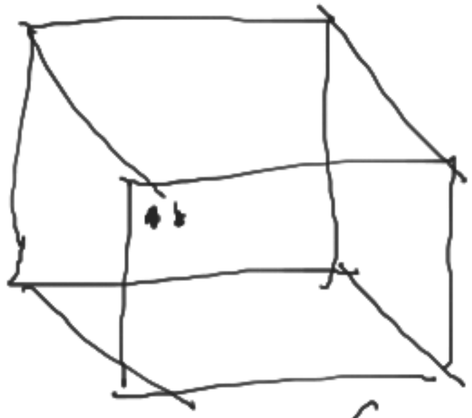
Image Space Method

1. Compare point to point pixel
2. Deals with viewport projection port co-ordinates.
3. Line & surface algo
4. 500x500

Object Space Method

1. Compares object part for visibility
2. Deals with physical co-ordinate
3. Line display algorithms
4. ↑

Coherence :- (Similarity)



calculation time

- rendering Time
- processing Time

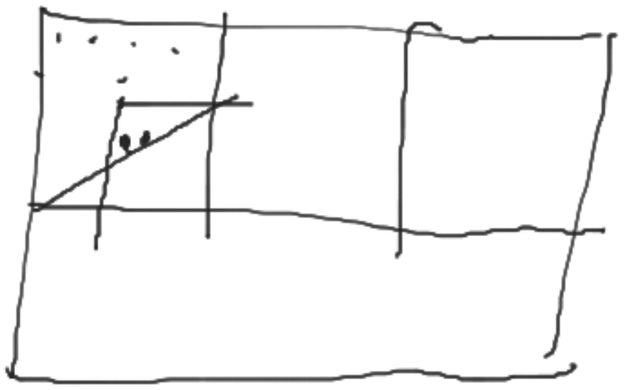
① Object Coherence :- Non Overlapping (Separate objects)

② Face Coherence :-

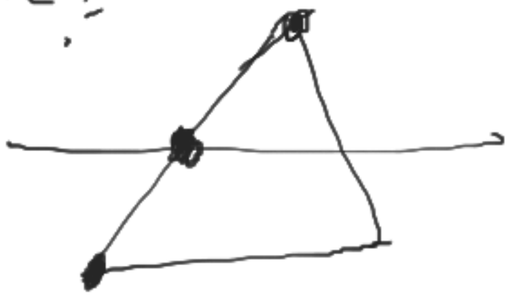
③ Edge Coherence :-

④ Area Coherence:

Window

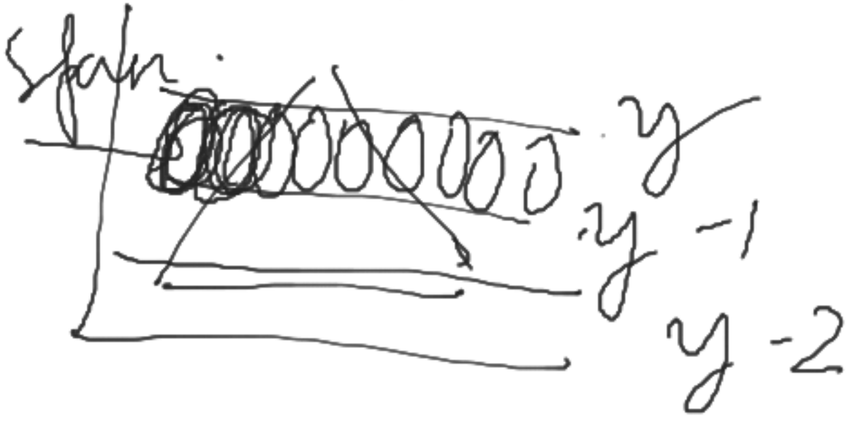


③ Implied Edge Coherence:



⑥ Span Coherence

A group of adjacent pixel of a span line

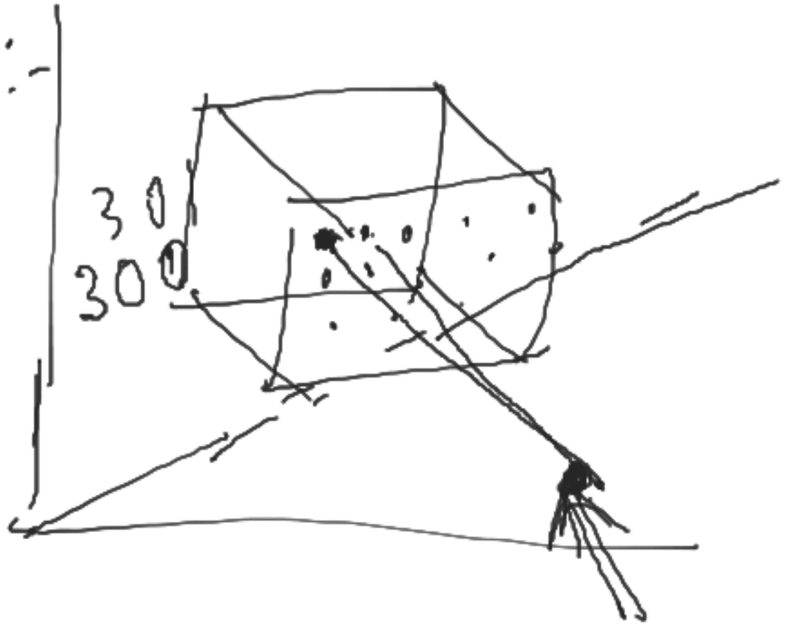


① Depth Coherence :-

Depth → Z value.

↓

Depth value.

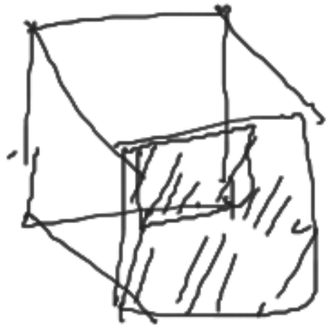


② frame Coherence :- 30 fps.

Back face Removal Algorithm

or

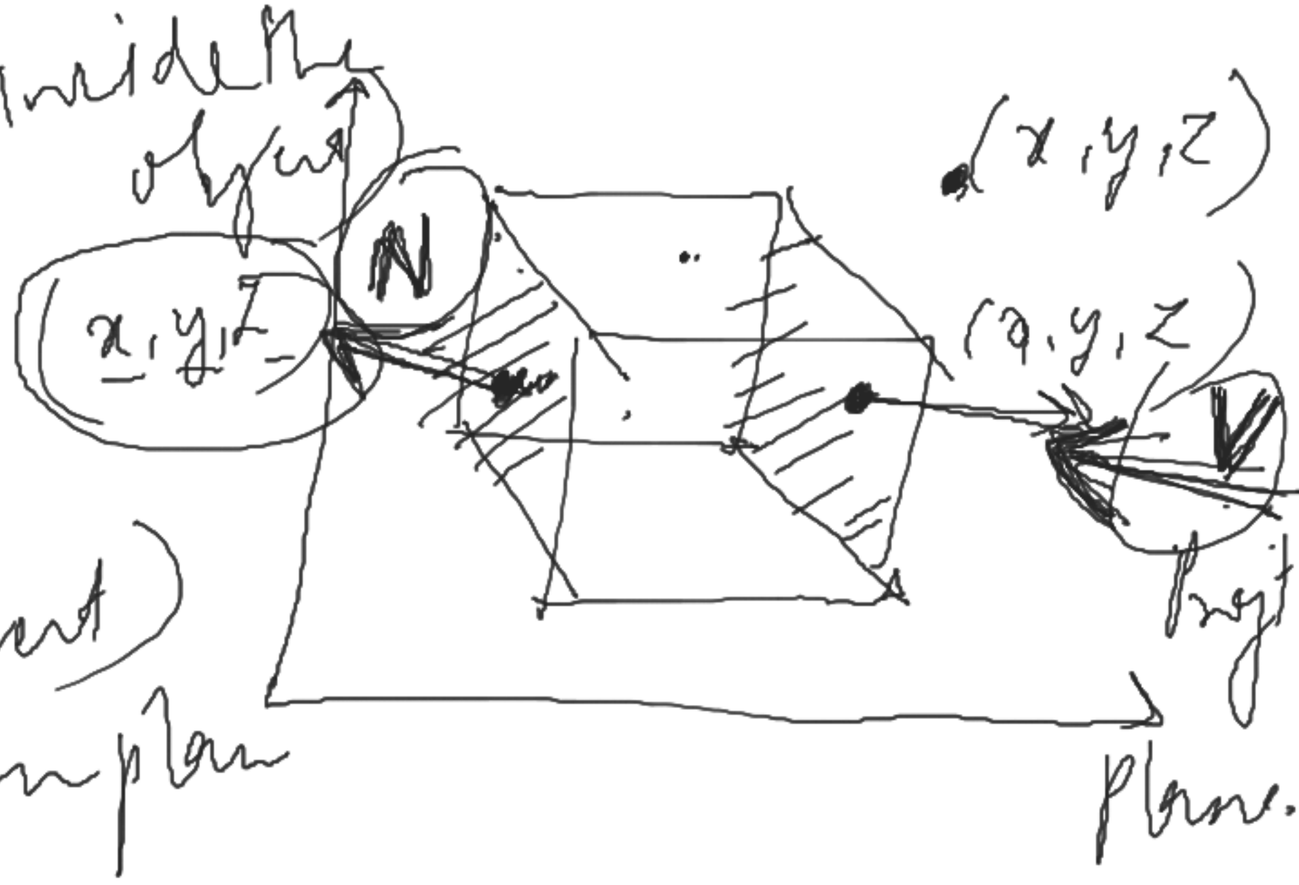
Hidden Surface Detection Algo.



→ Object Space Method.

① $Ax + By + Cz + D < 0$ (inside the object)

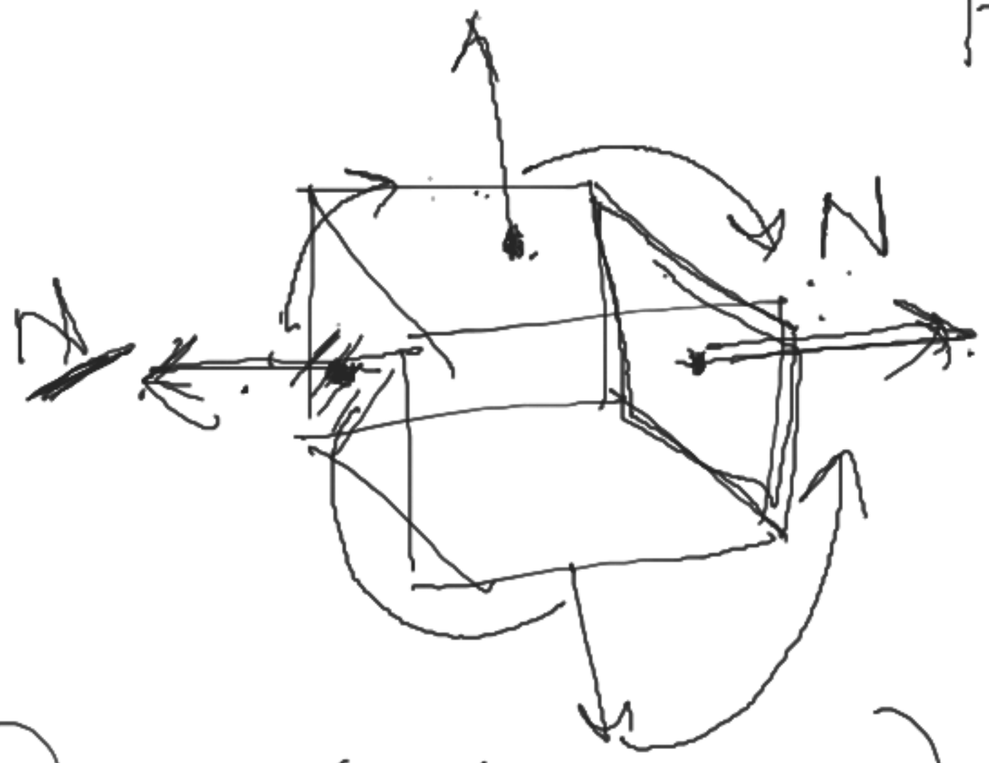
> 0 (outside the object but lies on plane)



② $V \cdot N > 0$ Backface (Hidden)

$|V||N| \cos\theta \quad 0 < \cos\theta < 1$

$0 < \theta < \pi/2$ } Backface



$\theta = 90^\circ$ $\quad N \perp V$ $\quad \theta = 0$

V $\quad 180^\circ$

$N \rightarrow \leftarrow V$

(3) $N(A\hat{i}, B\hat{j}, C\hat{k})$

(i, j, k) → are unit vector

$V(0, 0, V_z)$ along z-axis

$= V \cdot N$

$= V_z C$

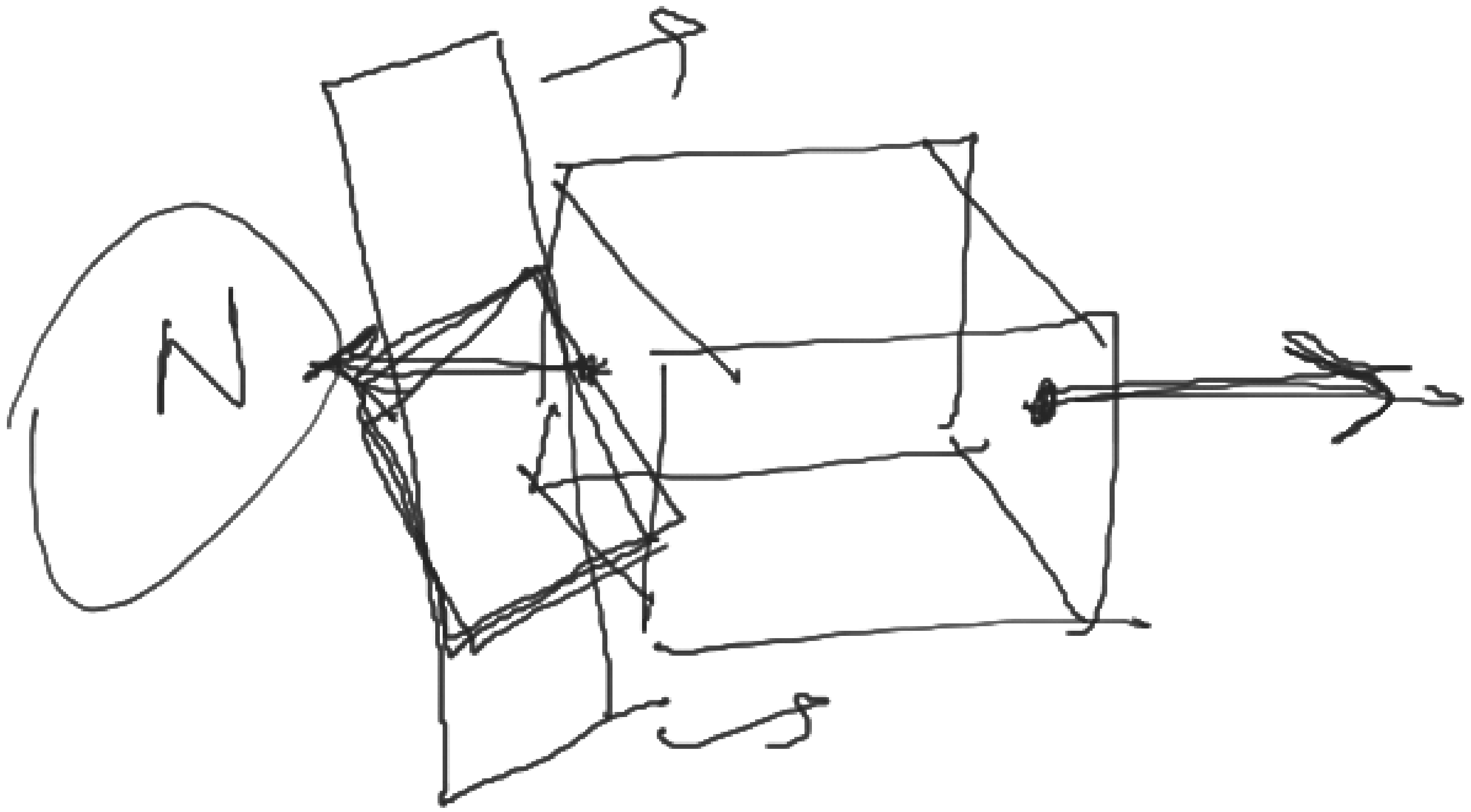
$V(0, 0, V_z)$

$N(A_i, B_j, C_k)$

Sign(C) ≤ 0 → Bf Hidden, Not visible.

> 0 (Visible

=



Drawback: Doesn't work well for partially hidden surfaces.

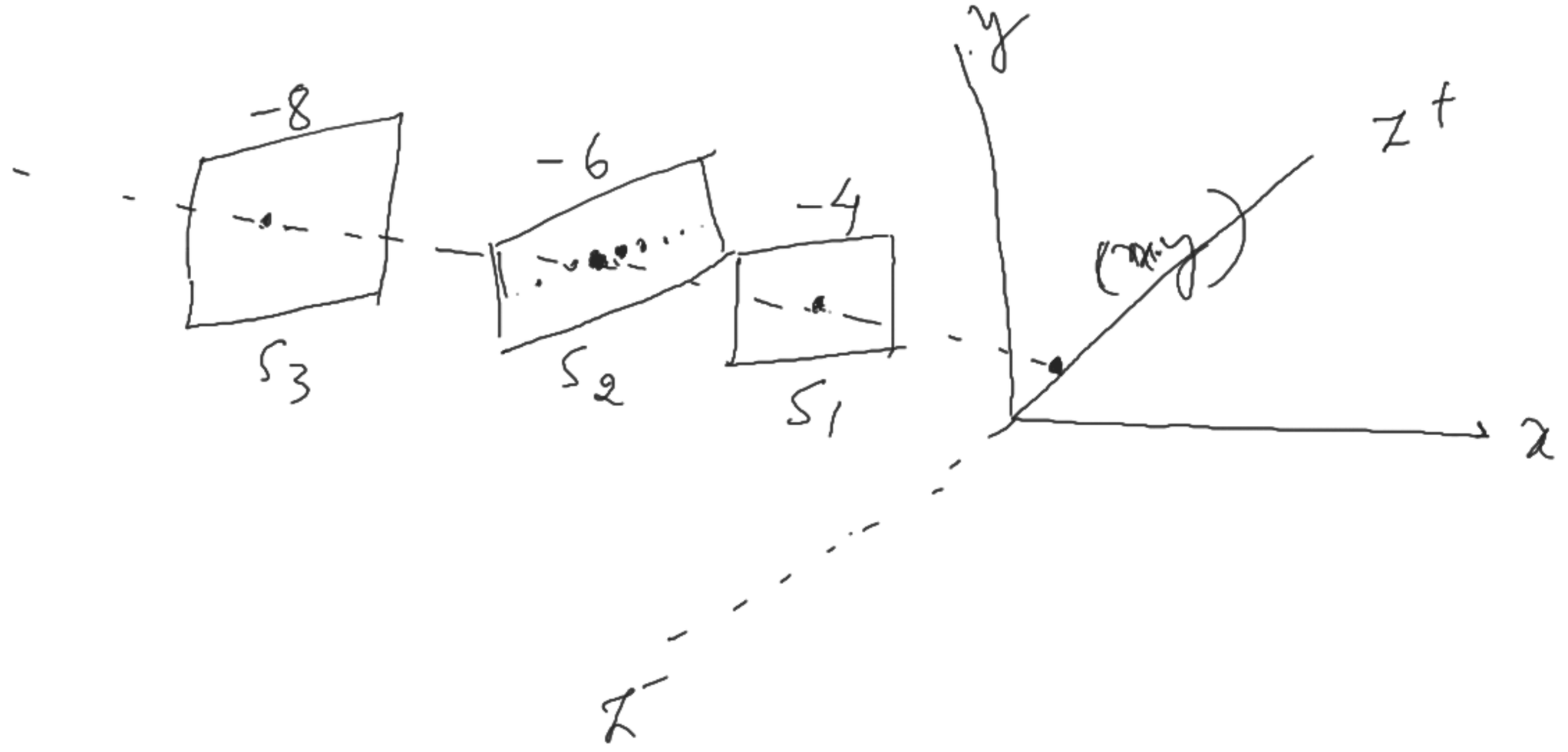
- (Z) Buffer Algorithm :- Depth

or

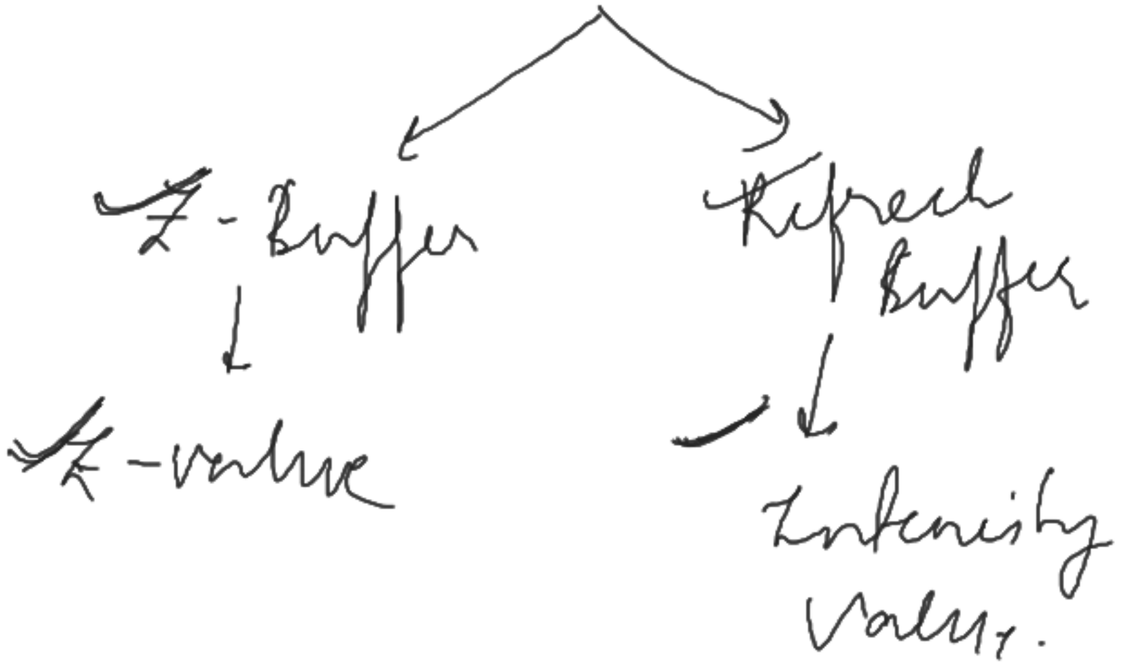
Depth Buffer Algorithm

→ It uses image space method to eliminate hidden surface.

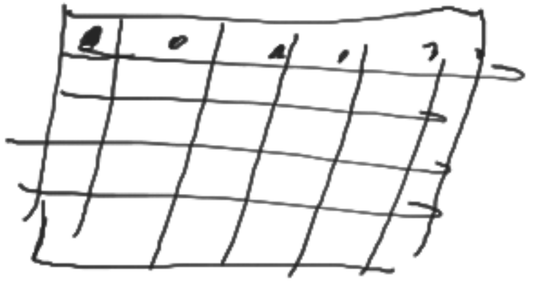
→ It compares surface depth at each pixel position to detect hidden surfaces.



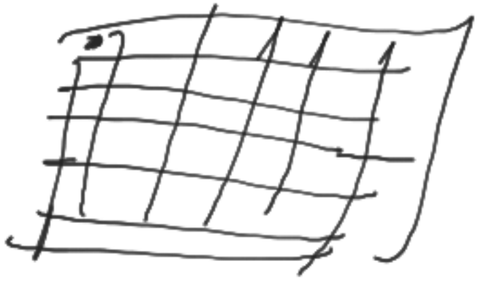
z - value → object or surface distance from view plane.
compare depth & calculate intensity of each pixel position.



S_z 512×512



Z-buffer



Refresh Buffer

Case I:

Sitting - $+z$

Viewing - $-z$

Larger z value - closer

Smaller z value - farther

$D(x,y) = 0$ Depth at pixel (x,y)

$R(x,y) = I_{background}$.

$z_{new} > D(x,y)$

$D(x,y) = z_{new}$

$R(x,y) = I_{new}$

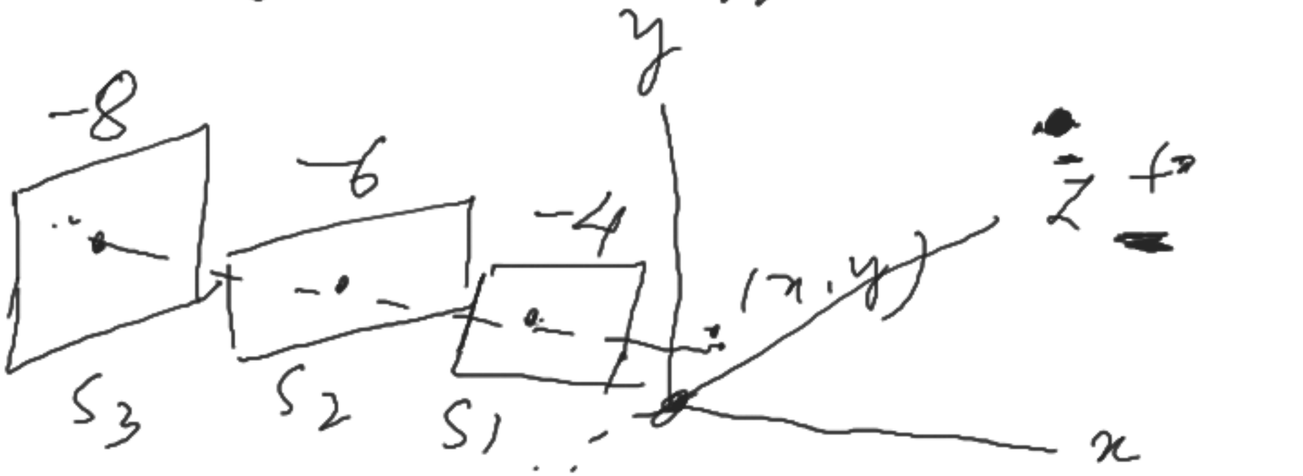
Case II:

Sitting : $-z$

Looking - $+z$

Larger z value - further

Smaller z value - closer



$D(x,y) = \infty$ z_{max}.

$R(x,y) = I_{background}$

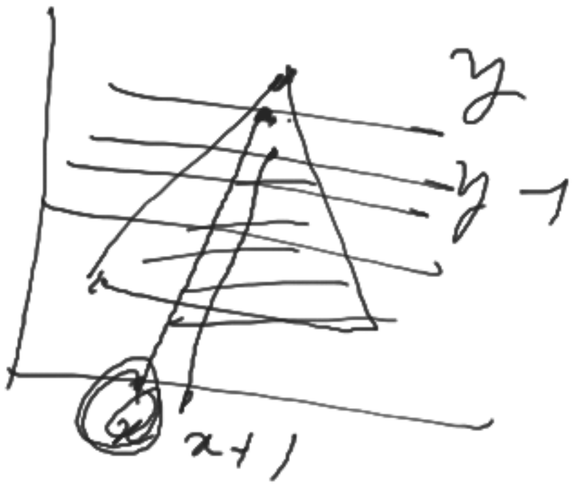
$z_{new} < D(x,y)$

$D(x,y) = z_{new}$ $R(x,y) = I_{new}$.

- Conform Equation :-

$$Ax + By + Cz + D \geq 0$$

$$z = \frac{-Ax - By - D}{C}$$



For $(x+1)$

$$z' = \frac{-A(x+1) - B(y) - D}{C} = \frac{-Ax - A - By - D}{C}$$

$$z' = z - \frac{A}{C}$$

$\left\{ \begin{array}{l} -A/C \\ = \text{constant} \end{array} \right.$

Depth Coherence.

- Shading
- Coloring
  - Color Model — RGB, CMY
  - Half Toning
  - —
  - —

5th