



Digital Differential Analyser DDA

Cons) Floating-point operations are expensive

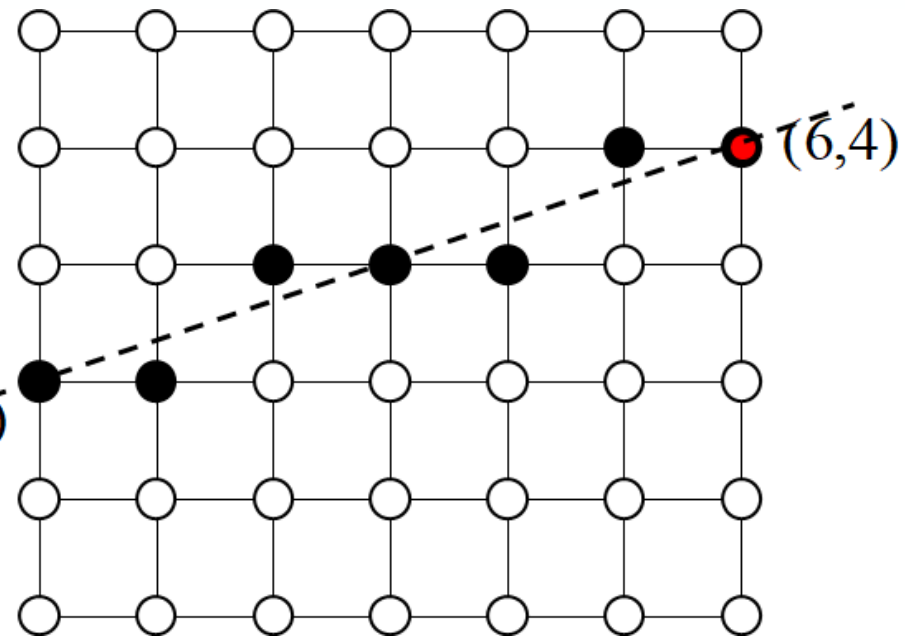
- A line in 2D is defined as: $y = kx + m$ where: x and y are variables (screen coordinates)
- Starts at (x_0, y_0) and ends at (x_1, y_1)

- slope: $k = \frac{\Delta y}{\Delta x} = \frac{(y_1 - y_0)}{(x_1 - x_0)}$

- Algorithm:

- ★ Start at (x_0, y_0) ;
- ★ Increase x by 1 and y by k
- ★ repeat until $x = x_1$

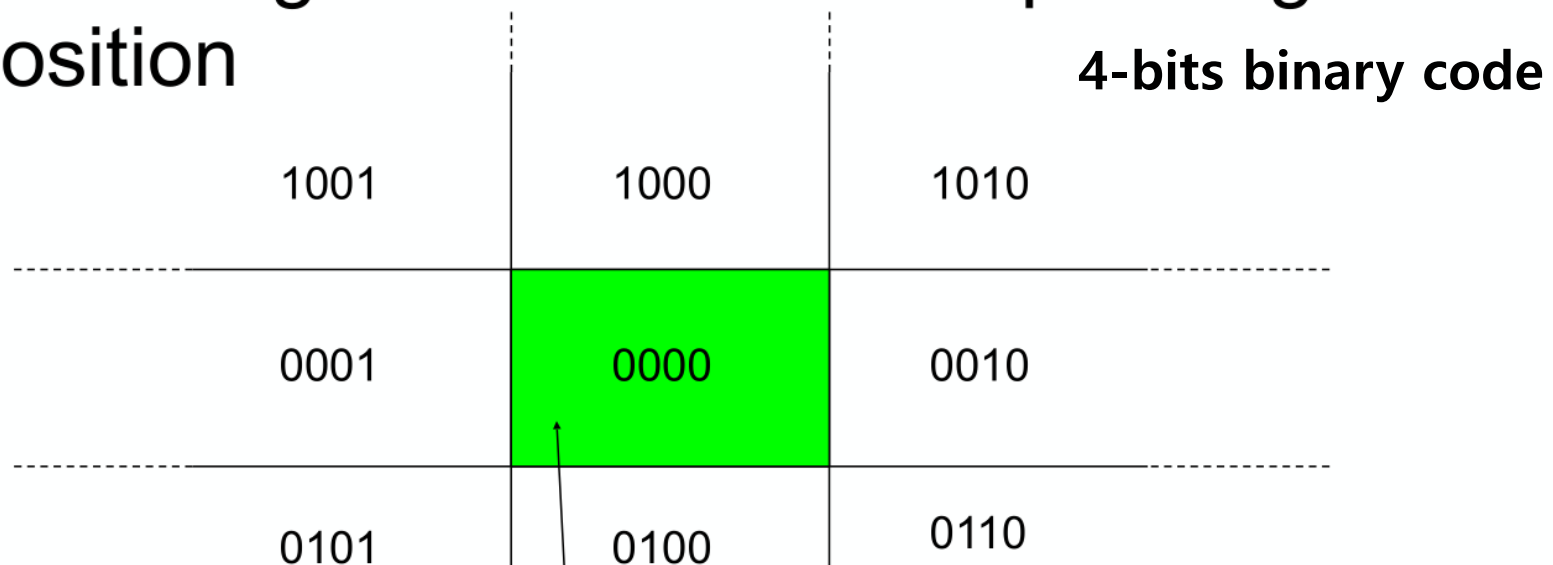
or Increase y by 1 and x by $1/k$ if $k > 1$





Cohen-Sutherland (in 2D)

- Divide space in 9 regions
- And assign codes to them depending on position



4-bits binary code

The viewport

First bit: above top edge
Second bit: below bottom edge
Third bit: to the right of right edge
Fourth bit: to the left of left edge



Example

- The endpoints are assigned an outcode
– 1000 and 0101 in this case

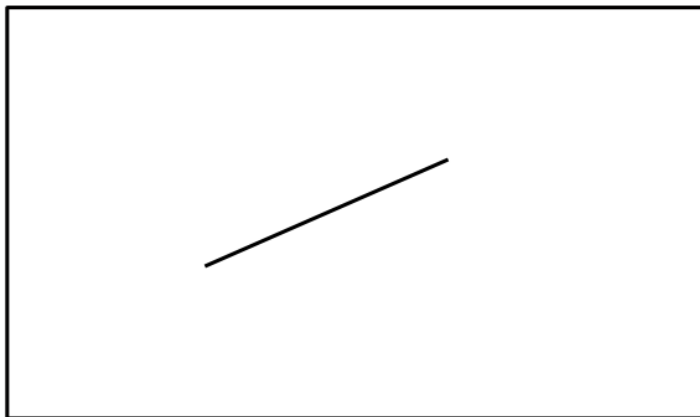
1001	1000	1010
0001	0000	0010
0101	0100	0110



Decision based on the outcode

- $o_1 = o_2 = 0000$

Both endpoints are inside the clipping window





Decision based on the outcode

- $o_1 \neq 0000$, $o_2 = 0000$ *or vice versa*

One endpoint is inside and the other is outside

- The line segment must be shortened





Decision based on the outcode

(bitwise AND)

- $o_1 \& o_2 \neq 0000$

Both endpoints are on the same side of the clipping window

– Trivial Reject



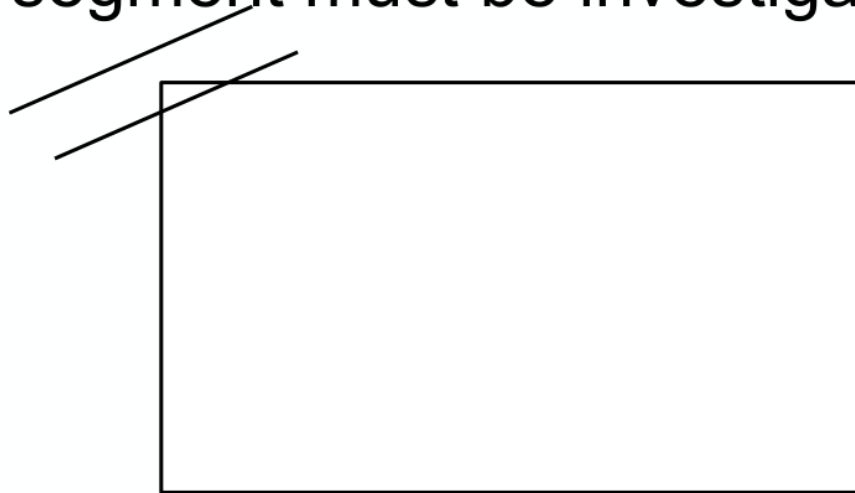


Decision based on the outcode

- $o_1 \& o_2 = 0000$

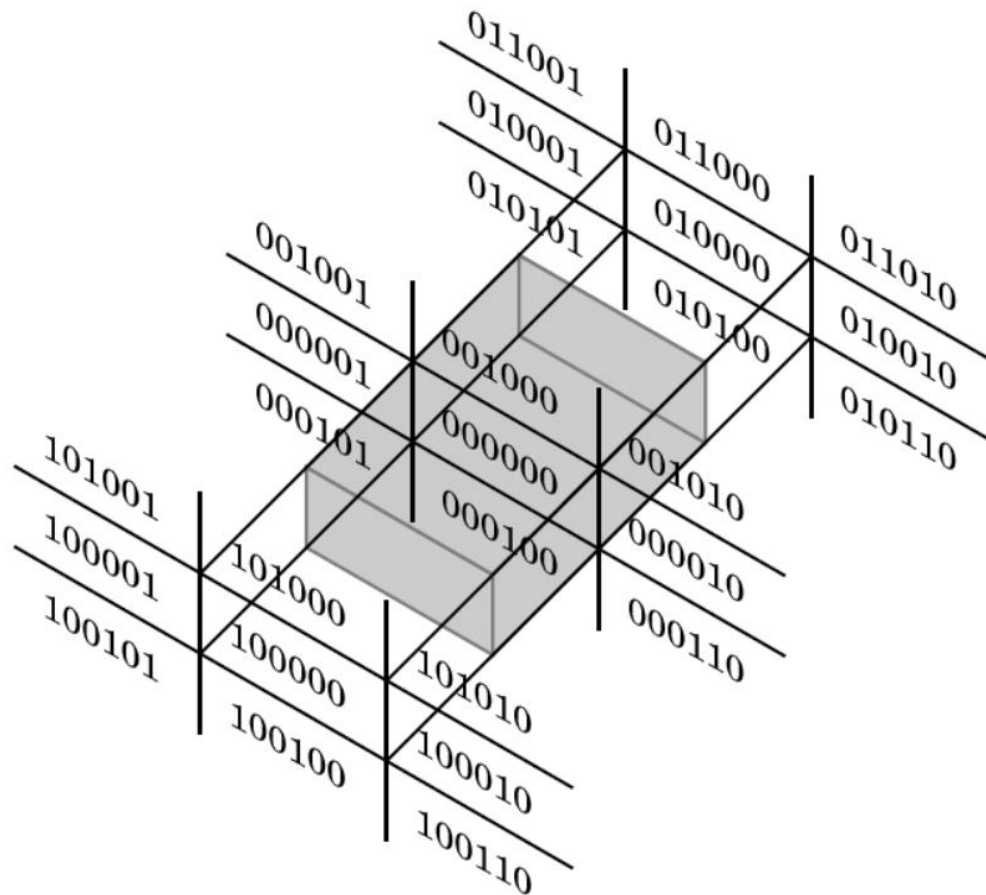
Both endpoint are outside but outside different edges

- The line segment must be investigated further



Cohen–Sutherland in 3D

- 27 regions with a 6 bit code



Acknowledgement

- Acknowledgement: Some materials come from the lecture slides of
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