

CSSE 351

Computer Graphics

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Fall 2012-2013

O267 8th Hour

October 15, 2012

25 : 2D & 3D clipping

Liang-Barsky clipping

- Form parametric equation of line
- Compute entrance and exit from clipping region
- Check if order is valid, clip if needed

Parametric lines

- Forming parametric line equation
 - Given points p_1 and p_2
 - Vector parallel to line is $p_2 - p_1$
 - ‘Start’ of line is p_1
 - All valid points on line are in range $p = p_1 + a(p_2 - p_1)$, where $0 \leq a \leq 1$

Parametric lines

- Forming parametric line equation
 - Given points p_1 and p_2
 - All valid points in line are between p_1 & p_2
 - Linearly interpolate between p_1 and p_2
 $p = (1-a)p_1 + a(p_2)$, where $0 \leq a \leq 1$

Liang-Barsky clipping

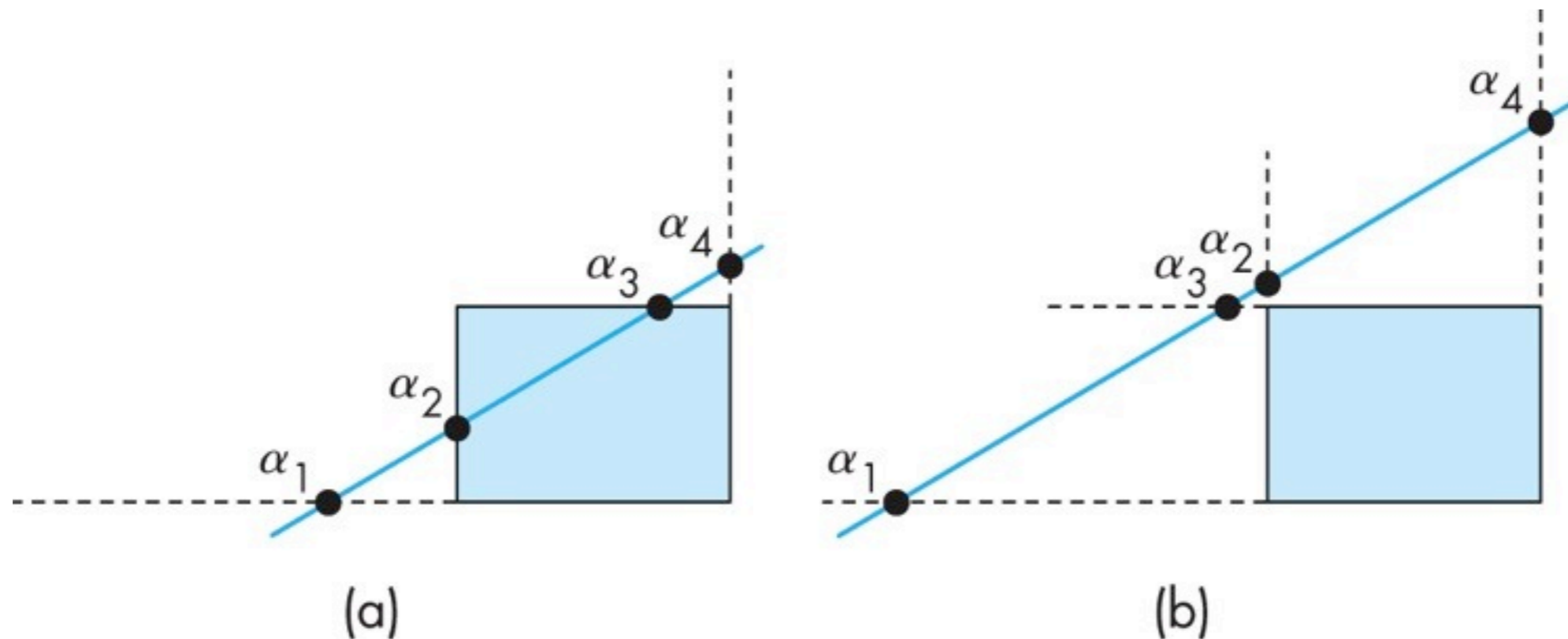
- Form parametric equation of line
- Compute entrance and exit from clipping region
- Check if order is valid, clip if needed

Compute intersect

- Clip region bounded by
 x_{\min} , x_{\max}
 y_{\min} , y_{\max}
- Split line equation into x and y forms:
 $x = (1-a)x_1 + a(x_2)$
 $y = (1-a)y_1 + a(y_2)$
- Solve for intersects

Compute intersect

- Clip region bounded by
- Solve for intersects



Compute intersect

- Set equal to intersect point
 $y_{\max} = (1-a)y_1 + a(y_2)$
- Check if a is bounded by 0 and 1
- Compute a intersects for all clip bounds

Compute intersect

- Check if entrance and exit intersects are in correct order
 - Must enter x or y bound
 - Must enter other axis bound
 - Then may exit either axes bounds

Liang-Barsky clipping

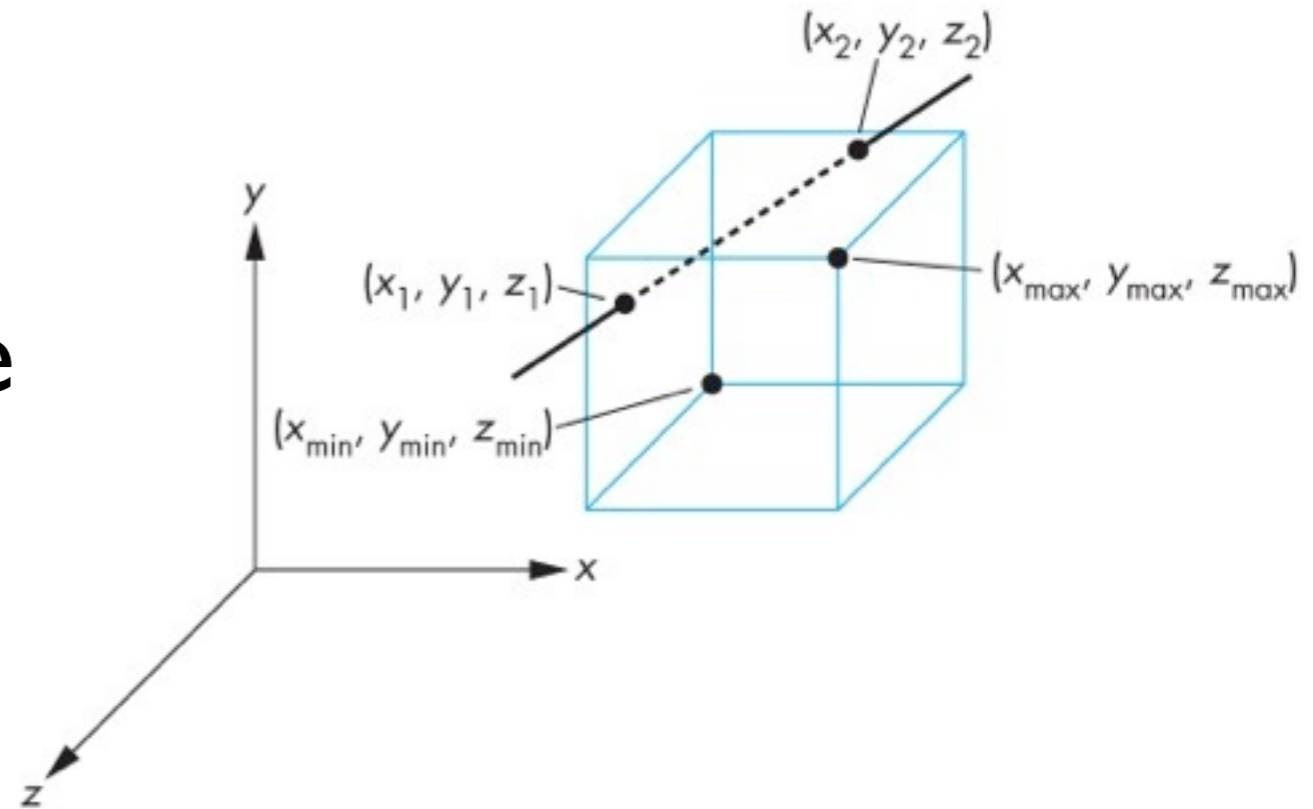
- Form parametric equation of line
- Compute entrance and exit from clipping region
- Check if order is valid, clip if needed

Clip line segment

- If entrance and exit are valid
 - Already have intersect points
 - Line is between:
last entrance point and first exit point

3D Liang-Barsky

- Add z intersect case
 $z = (1-a)z_1 + a(z_2)$



- Make clipping planes axis aligned for fast intersects