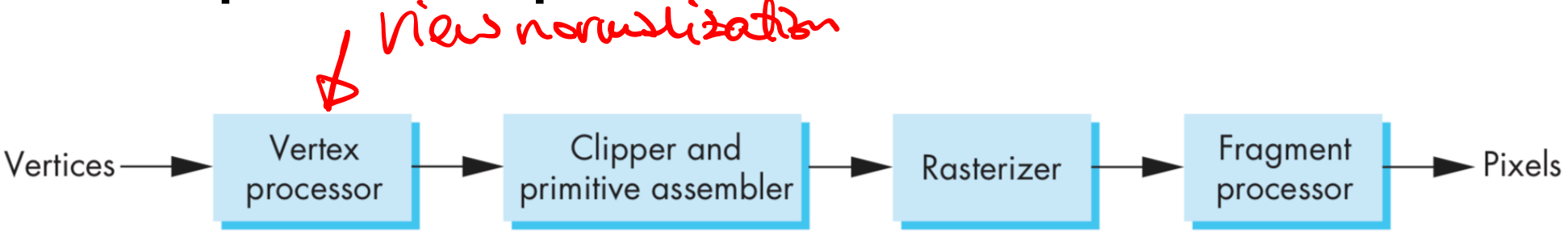
COMP3271 Computer Graphics

Clipping & Rasterization

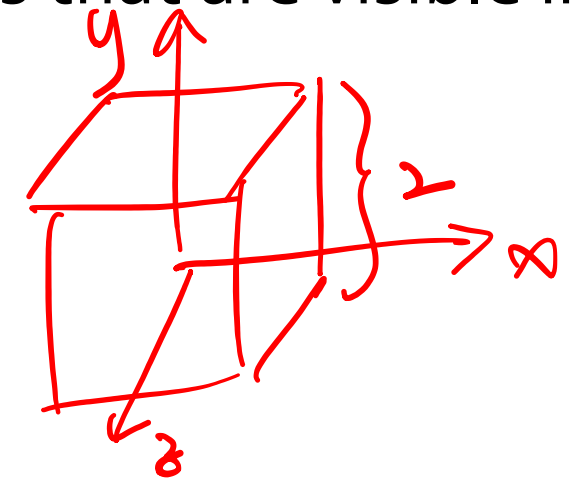
2019-20

Graphics Pipeline Overview



Clipping — To eliminate objects (or part of objects) that lie outside the viewing volume

Rasterization — To produce fragments from the remaining objects that are visible in the final image



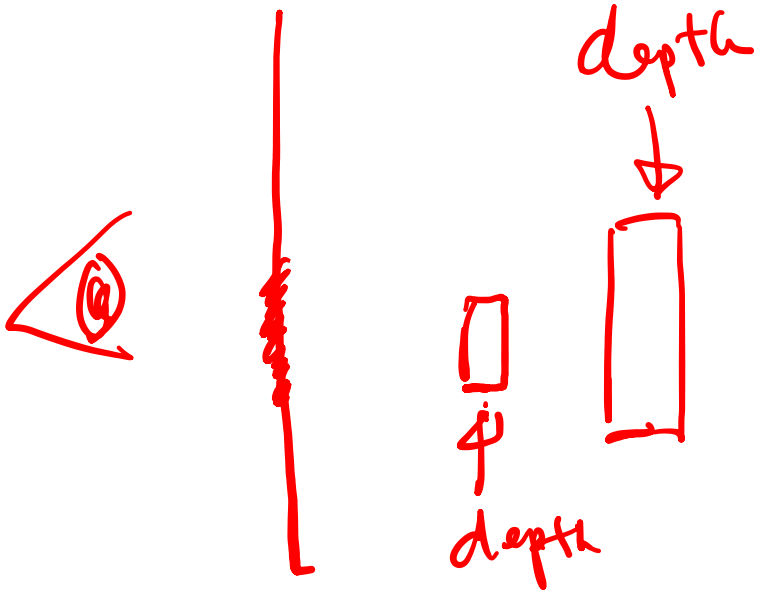
Two Rendering Approach

For every pixel, determine which object that projects on the pixel is closest to the viewer and compute the shade of this pixel

- Ray tracing paradigm

For every object, determine which pixels it covers and shade these pixels

- Pipeline approach
- Must keep track of depths



Clipping

2D against clipping window

3D against clipping volume

Easy for line segments & polygons

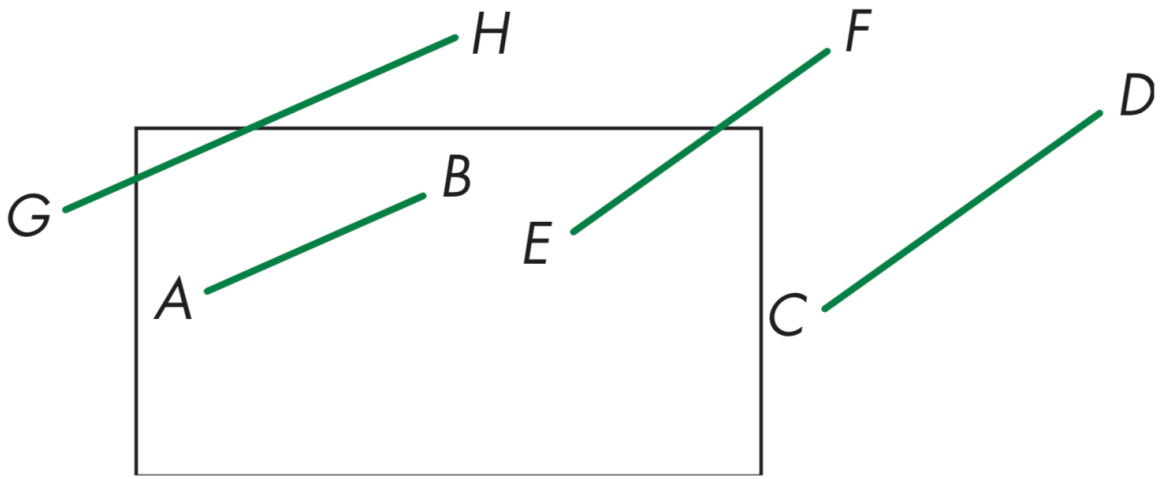
Hard for curves and text

- Convert to lines and polygons first

Clipping 2D Line Segments

Brute force approach: compute intersections with all sides of clipping window

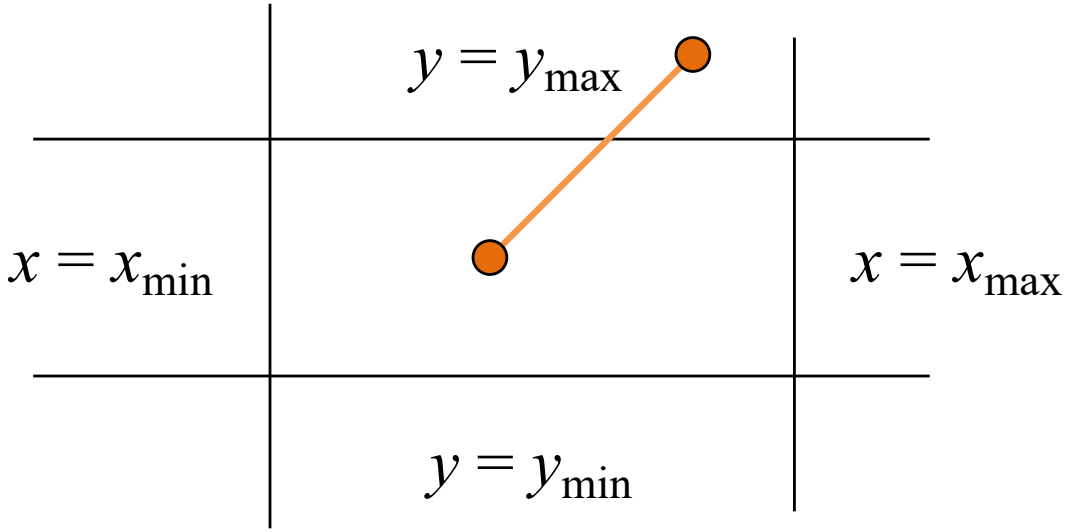
- Inefficient: one division per intersection



Cohen-Sutherland Algorithm

Idea: eliminate as many cases as possible without computing intersections

Start with four lines that determine the sides of the clipping window

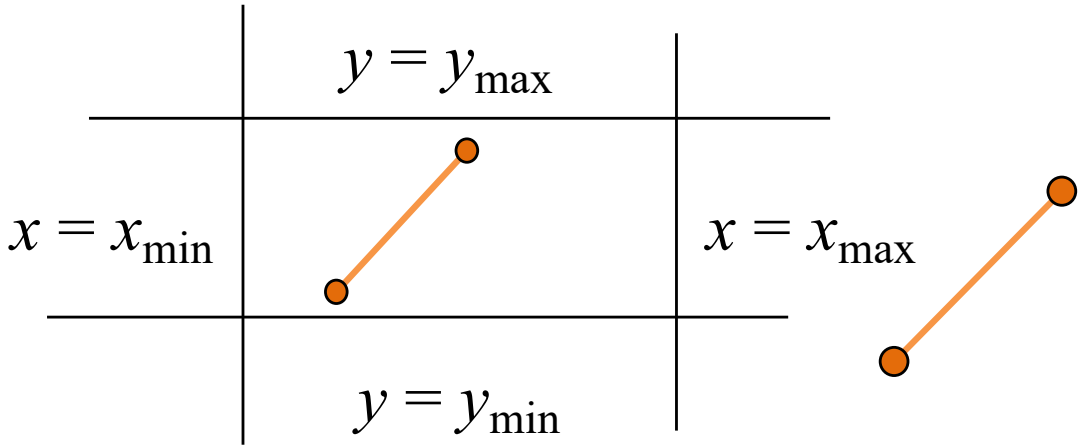


Viewing volume must be axis-aligned

The Cases

Case 1: both endpoints of line segment inside all four lines

- Draw (accept) line segment as is



Case 2: both endpoints outside all lines and on same side of a line

- Discard (reject) the line segment

The Cases

Case 3: One endpoint inside, one outside

- Must do at least one intersection

Case 4: Both outside

- May have part inside
- Must do at least one intersection