Scanline Fill

Performance Improvements

**brute force: intersect all the edges with each scanline**

1) Improvement 1:

find the ymin and ymax of each edge and intersect the edge only when it crosses the scanline

2) Improvement 2:

a) only calculate the intersection of the edge with the 1st scanline it intersects
b) calculate dx/dy
c) for subsequent scanlines, derive new intersections as $x = x + dx/dy$

3) Improvement 3:

change $x = x + dx/dy$ to integer arithmetic
Data Structures

1. Edge Table

- keep a separate bucket for each scanline
- all edges sorted by their ymin and inserted into the table
- within each bucket, edges are sorted by increasing x of the ymin endpoint

Edge structure: ymax, xmin, dx/dy, next

AB: 3, 6, -2, BC
Scanline Fill

Data Structures (cont’d)

1. Active Edge Table

A list of edges that are active for current scanline, sorted by increasing x intersection

Scanline 8
FA -> EF -> DE -> CD

Scanline 9
DE -> CD
Scanline Fill

Algorithm

Construct the Edge Table (ET)

\[ y = \text{smallest} \ y \ \text{in the ET} \]

Active Edge Table (AET) = NULL

for \( y = \text{ymin} \) to \( \text{ymax} \)

Merge-sort \( \text{ET}[y] \) into AET by x value

Fill between pairs of x in AET

for each edge in AET

if \( \text{edge.ymax} = y \)
    remove edge from AET
else
    \( \text{edge.x} = \text{edge.x} + \frac{dx}{dy} \)

Sort AET by x value (as needed)

end scan_fill