CS 461 - Computer Graphics

Polygon Filling

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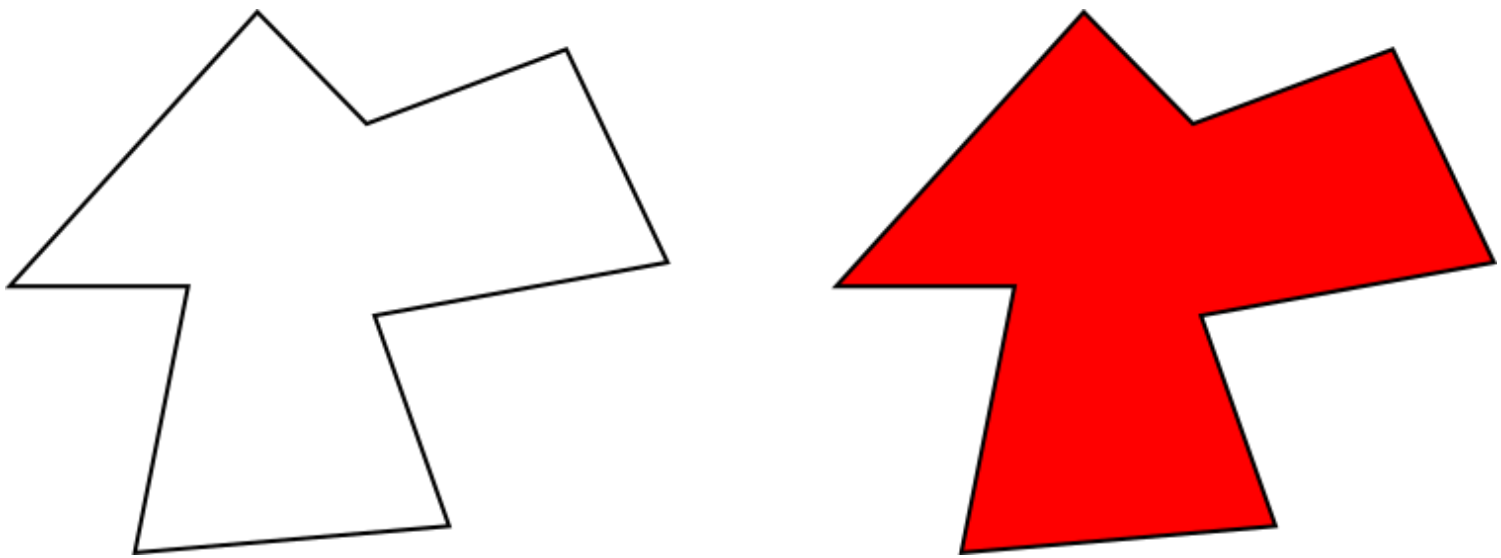
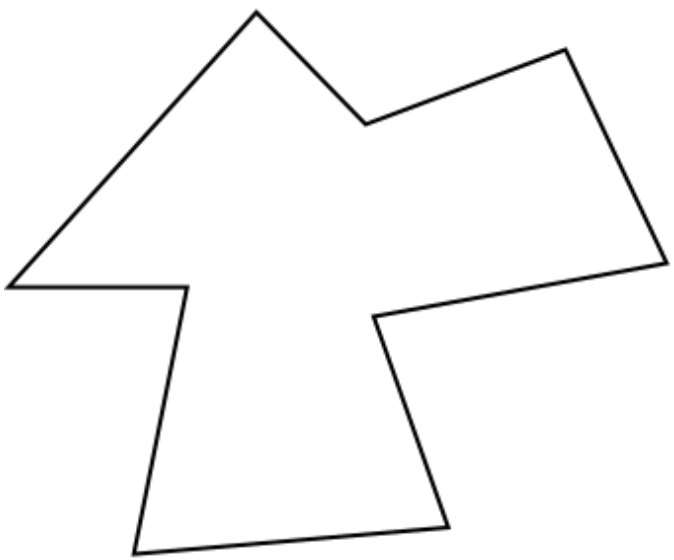
Fill Algorithms

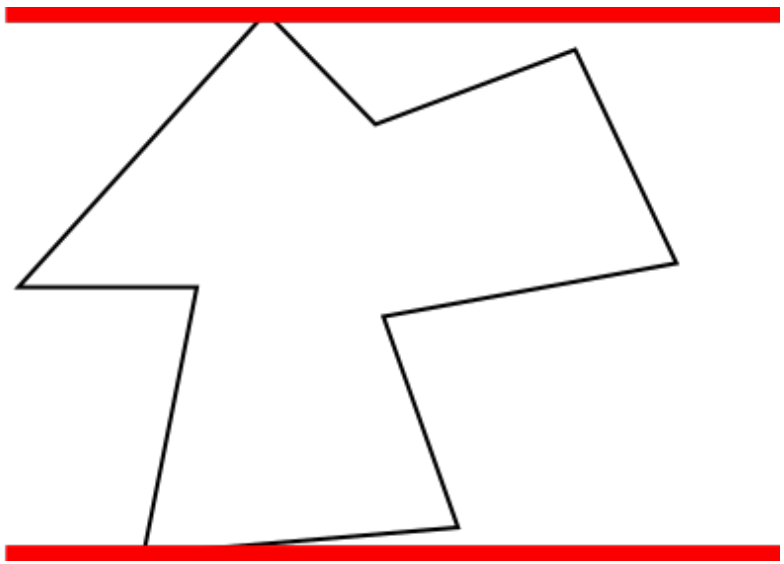
- Fill all the pixels inside the polygon
- Three algorithms:
  - Scan-line fill
  - Boundary fill
  - Flood fill
- Depends on the requirement



Scan-line fill algorithm - concept

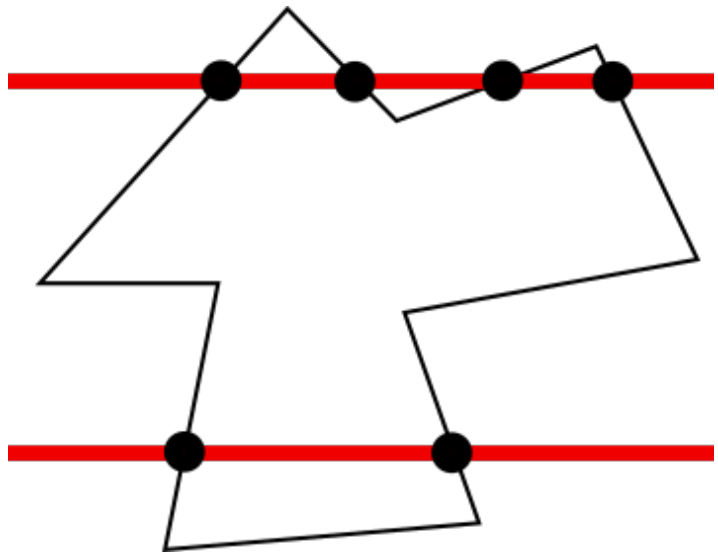
- Finding the ***min***s and ***max***s
- Moving the line up/down
- Find intersections





Odd/even intersections

- Odd intersections - start coloring
- Even intersections - stop coloring



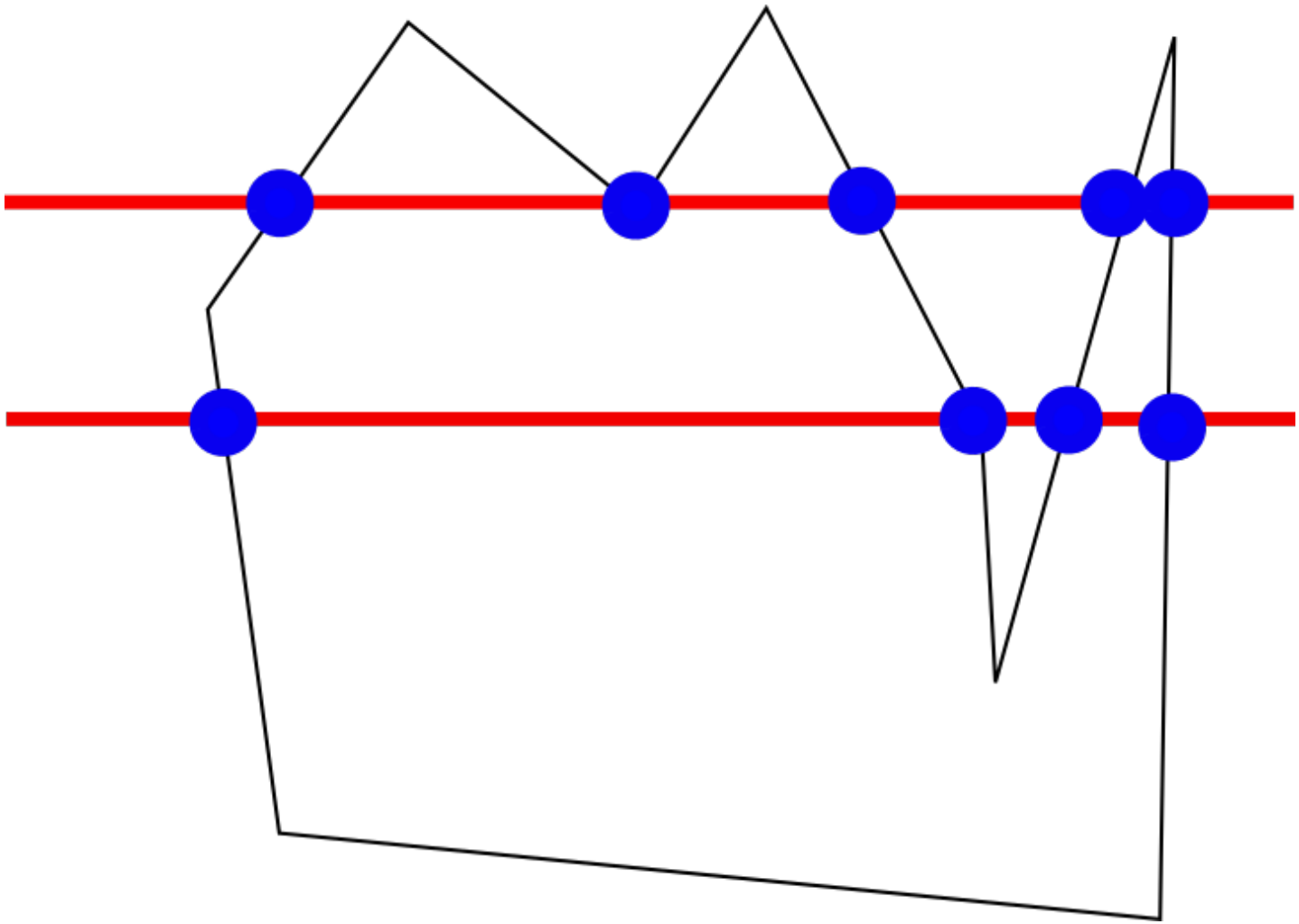
Overall algorithm

Algorithm 1: Scan-line fill Algorithm

Find the intersections of the scan line with all edges of the polygons
Sort the intersections (based on x-coordinates)
Fill in all pixels between pairs of intersections

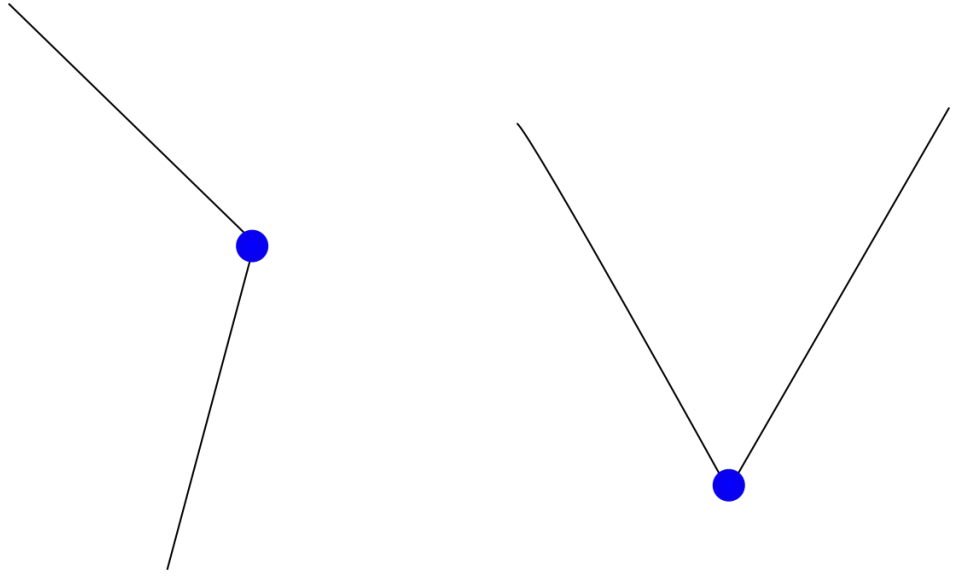
Vertex-line intersection

- Previous idea is not good enough



Handling vertex-line intersection

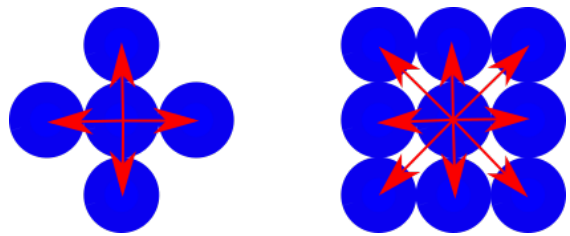
- Two cases



- Advantages
- Concept of SET (Sorted Edge Table)

Boundary-fill algorithm

- 4-connected
- 8-connected

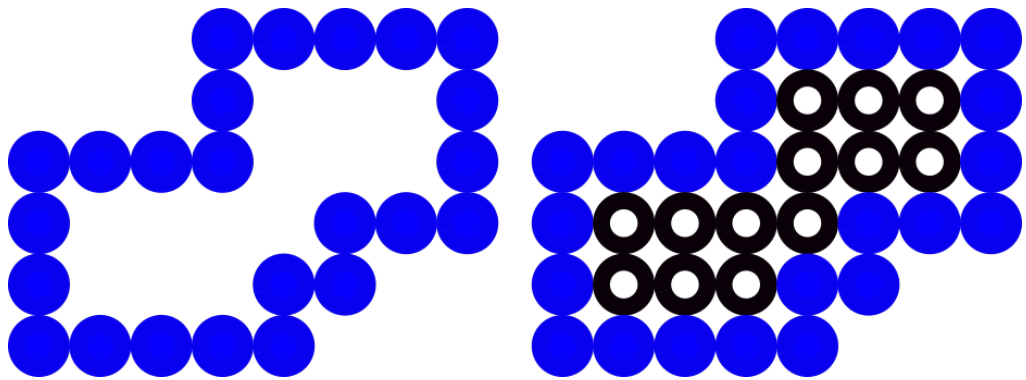


Boundary-fill algorithm

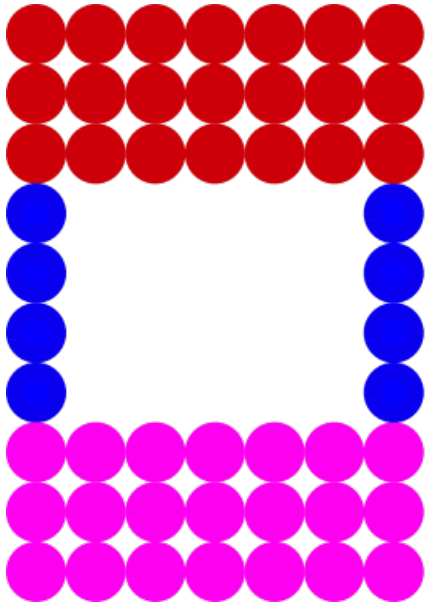
Algorithm 2: boundaryFill4(x,y,fillColor,borderColor)

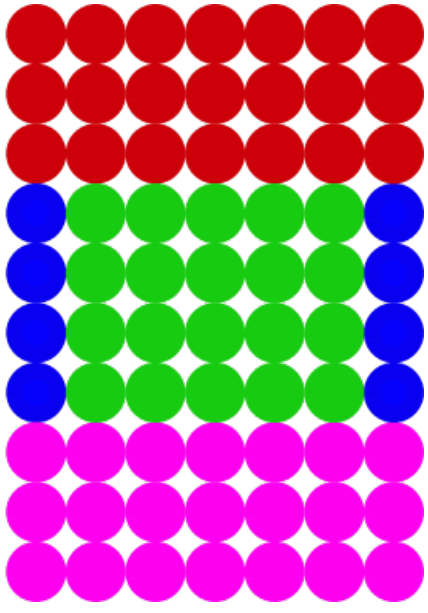
```
int color
getPixel(x,y,color)
if (color!=borderColor&&color!=fillColor) then
    setPixel(x,y)
    boundaryFill4(x+1,y,fillColor,borderColor)
    boundaryFill4(x-1,y,fillColor,borderColor)
    boundaryFill4(x,y+1,fillColor,borderColor)
    boundaryFill4(x,y-1,fillColor,borderColor)
end
```

Boundary-fill algorithm - example



Flood-fill algorithm - example





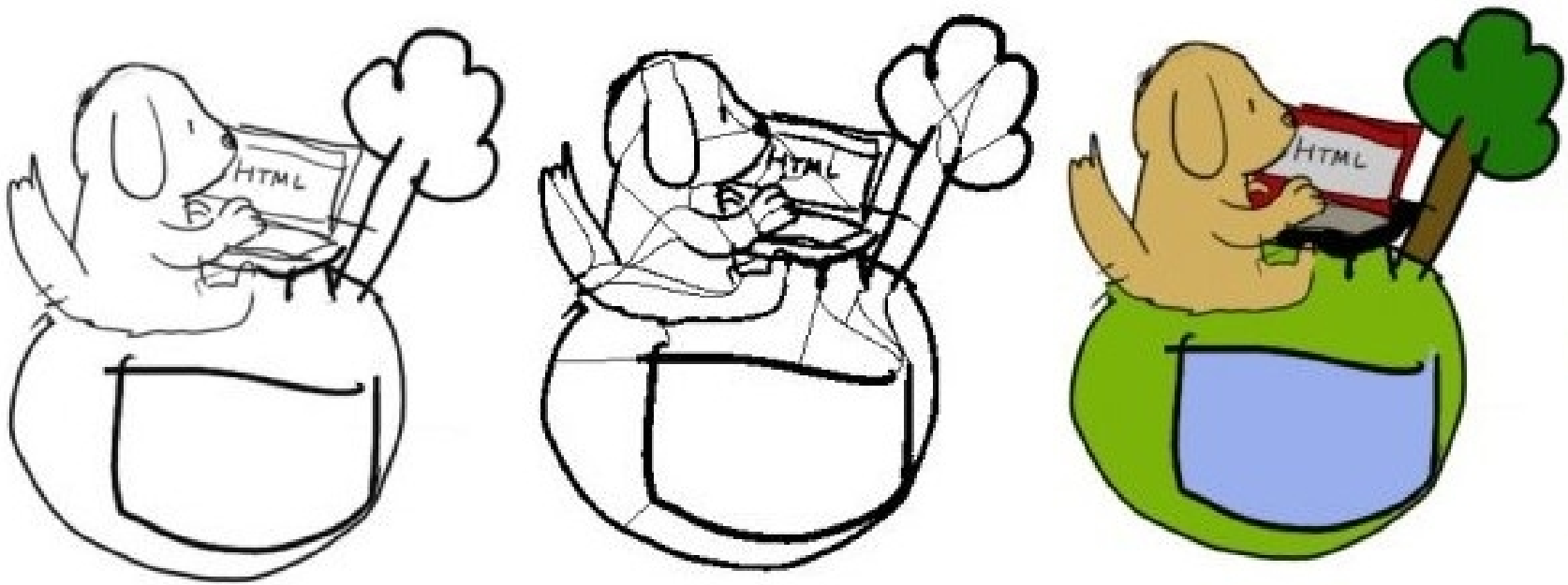
Flood-fill algorithm

Algorithm 3: FloodFill4(x,y,fillColor,interiorColor)

```
int color
getPixel(x,y,color)
if (color==interiorColor) then
    setPixel(x,y)
    FloodFill4(x+1,y,fillColor,interiorColor)
    FloodFill4(x-1,y,fillColor,interiorColor)
    FloodFill4(x,y+1,fillColor,interiorColor)
    FloodFill4(x,y-1,fillColor,interiorColor)
end
```

Coloring sketches with gaps

A fast and efficient semi-guided algorithm for flat coloring line-arts



Delaunay-based coloring

Next class

- Schedule: 17^{th} Sep 9-10
- Topic: Clipping algorithms
- Seminars???