CSC 240
Computer Graphics

Fall 2015
Smith College
Outline: 9/16

- Polygons
- Flood fill algorithm
- Better fill algorithm
Polygon

- Chain of line segments that form a closed loop
Simple Polygon

- no self intersections
Complex Polygon

- self intersections
Convex Polygon

- Every internal angle is less than or equal to 180 degrees.
- (all vertices point outward)
- Every line segment between two vertices remains inside or on the boundary of the polygon.
- (no dents)
Concave Polygon

- There exist an internal angle is greater than 180 degrees.
- (at least one vertex points inward)
- There exists at least one line segment between two vertices that exits the boundary of the polygon.
- There is a “dent” or “cave”
More polygons

Simple

Convex

Concave

Cyclic

Equilateral

Equiangular

Regular convex

Regular star

"Polygon types" by Salix alba, Wikipedia
Qualities of a good Polygon Algorithm

- good line
- approximates line
- constant weight
- fast
- No cracks between adjacent polygons
Flood Fill

- Pick a pixel inside the fill area
  - Fill the pixel
  - Repeat with neighboring non-edge pixels
Recursion!

Lab 3
Flood Fill: example code

```python
# flood_fill takes a pixel location (x,y), an old_color (what we want
# to replace), and a new_color (replacement color)
def flood_fill(img, x, y, old_color, new_color):

    curr_color = img.getPixel(x, y)

    if curr_color == new_color:
        return # nothing to do, finished
    if curr_color != old_color:
        return # hit an edge, finished

    img.setPixel(x, y, new_color)  # curr_color must have been old_color, "fill" it

    # recurse!
    flood_fill(img, x-1, y, old_color, new_color)  # east
    flood_fill(img, x+1, y, old_color, new_color)  # west
    flood_fill(img, x, y-1, old_color, new_color)  # south
    flood_fill(img, x, y+1, old_color, new_color)  # north

    return
```
Flood Fill result
Better Fill Algorithm

- Triangle sweep
Polygons

• How do we know if we are inside?
Convex Polygons

- Triangle Method
Concave
Polygon Sweep Algorithm