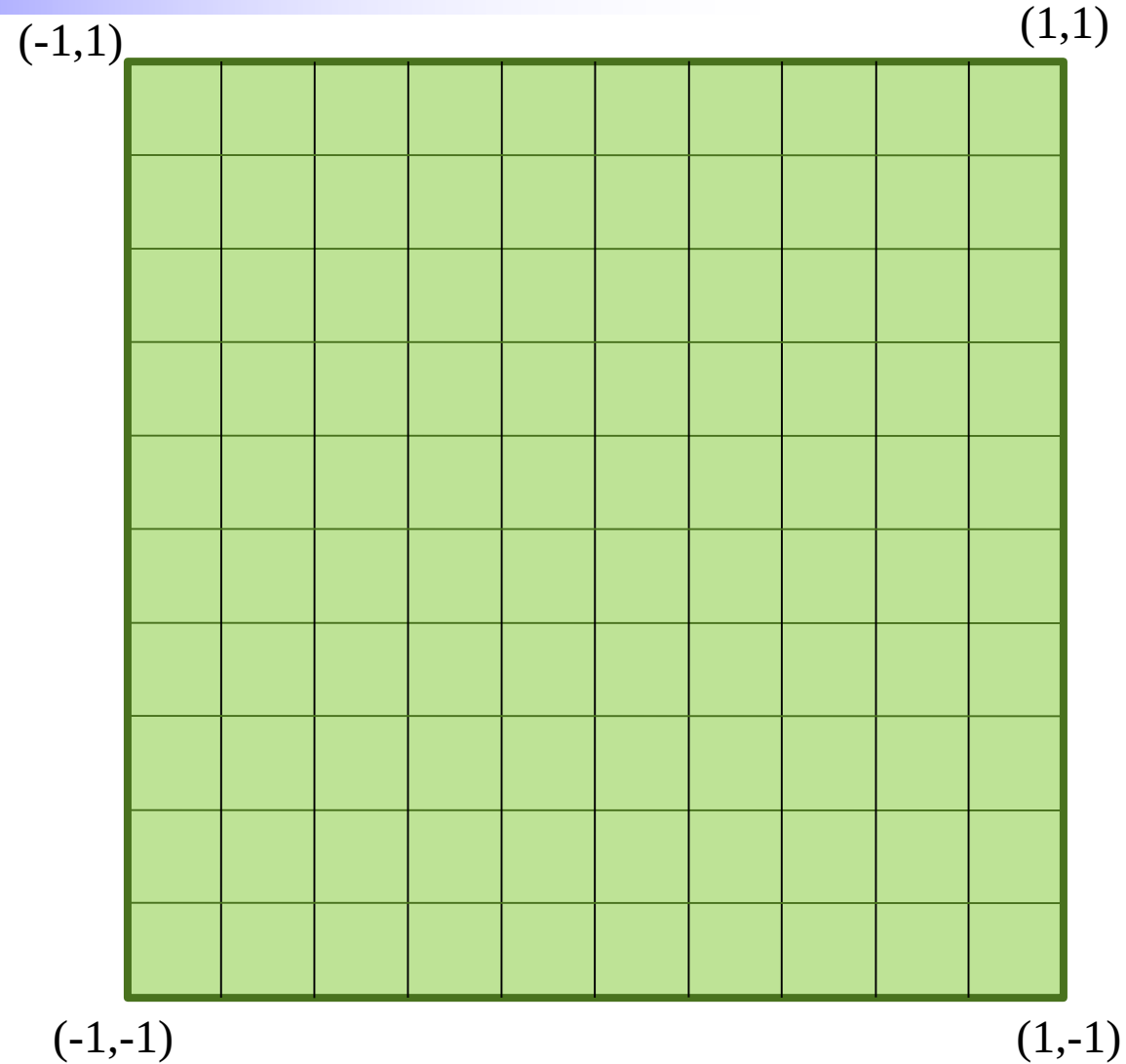


Filling The Pipeline

CS418 Computer Graphics

John C. Hart

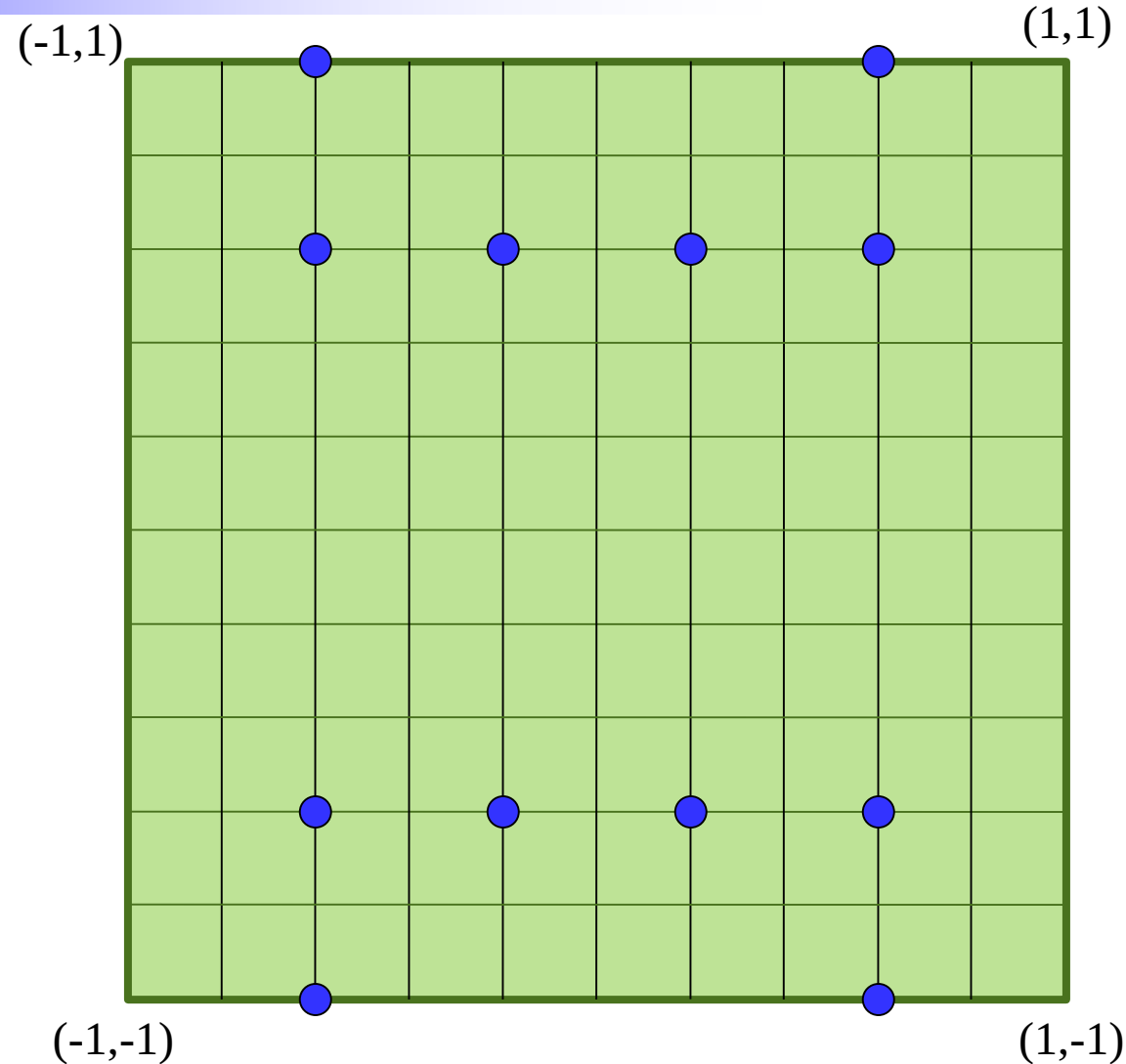
Window Coordinates



Points

```
[ -0.6,  1.0,  
  -0.6,  0.6,  
  -0.2,  0.6,  
  -0.2, -0.6,  
  -0.6, -0.6,  
  -0.6, -1.0,  
   0.6, -1.0,  
   0.6, -0.6,  
   0.2, -0.6,  
   0.2, -0.6,  
   0.6,  0.6,  
   0.6,  1.0];
```

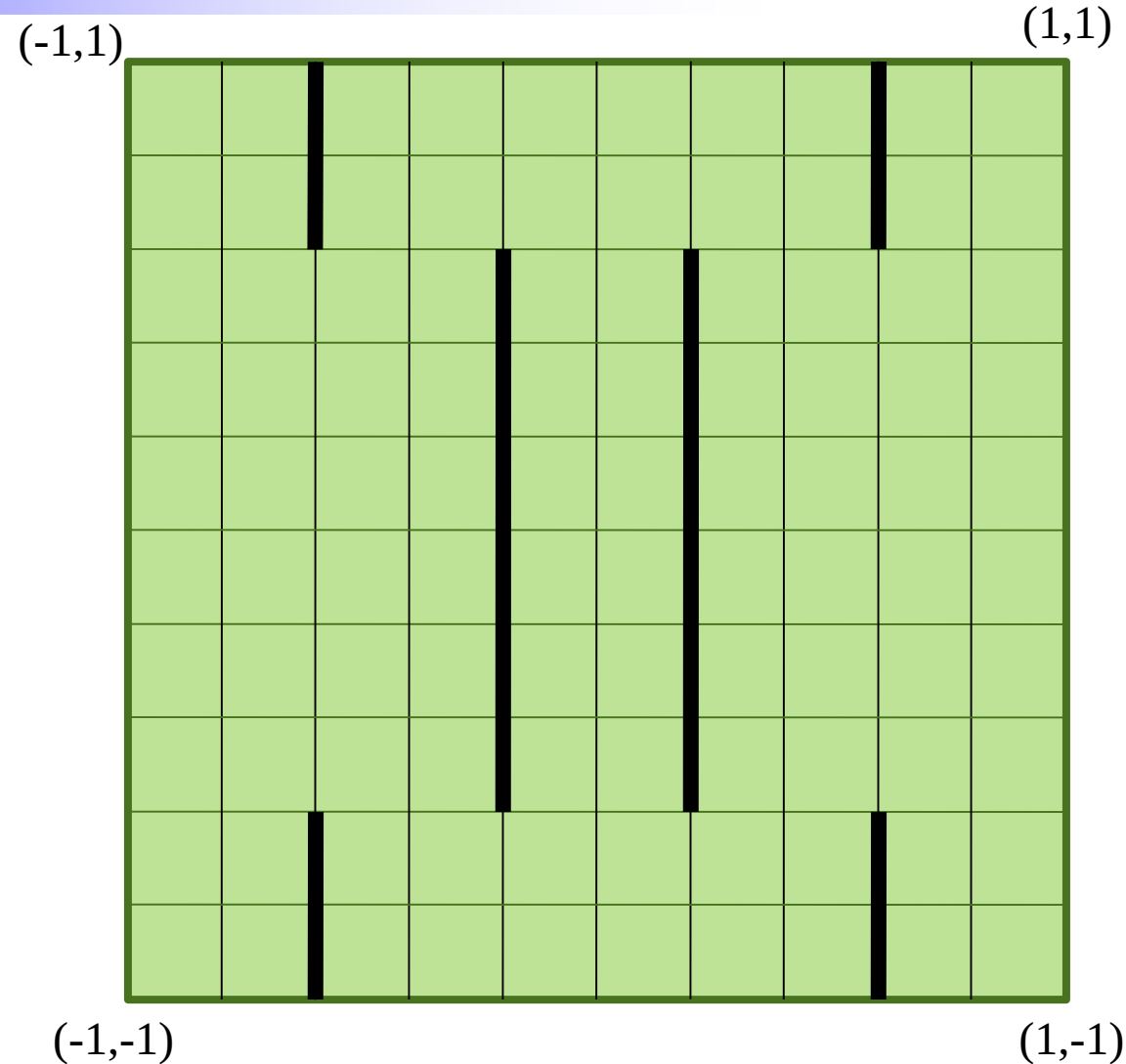
```
gl.drawArrays(  
  gl.POINTS, ...)
```



Lines

```
[ -0.6,  1.0,  
  -0.6,  0.6,  
  -0.2,  0.6,  
  -0.2, -0.6,  
  -0.6, -0.6,  
  -0.6, -1.0,  
   0.6, -1.0,  
   0.6, -0.6,  
   0.2, -0.6,  
   0.2, -0.6,  
   0.6,  0.6,  
   0.6,  1.0];
```

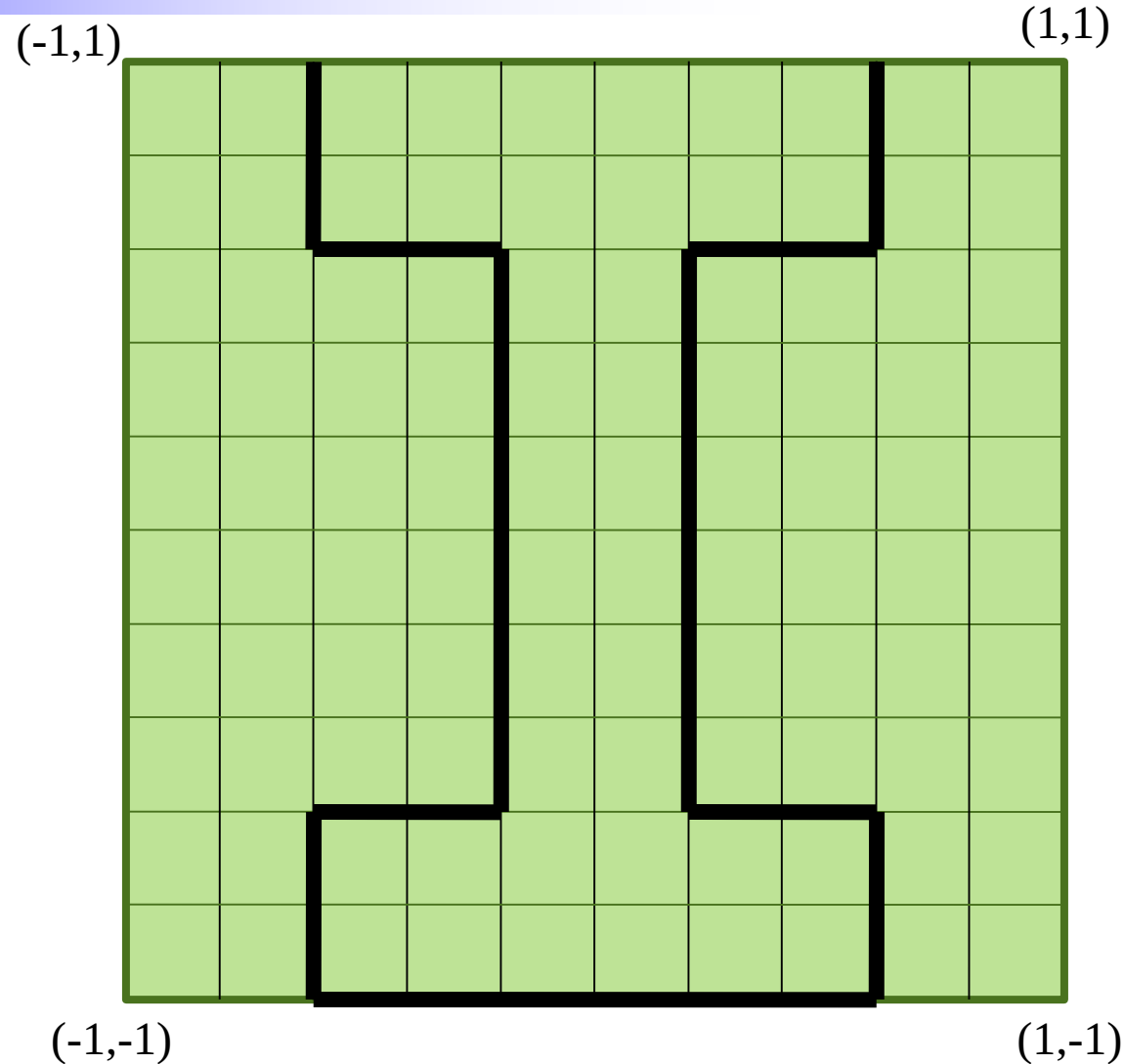
```
gl.drawArrays(  
  gl.LINES, ...)
```



Line Strip

```
[ -0.6,  1.0,  
  -0.6,  0.6,  
  -0.2,  0.6,  
  -0.2, -0.6,  
  -0.6, -0.6,  
  -0.6, -1.0,  
   0.6, -1.0,  
   0.6, -0.6,  
   0.2, -0.6,  
   0.2, -0.6,  
   0.6,  0.6,  
   0.6,  1.0];
```

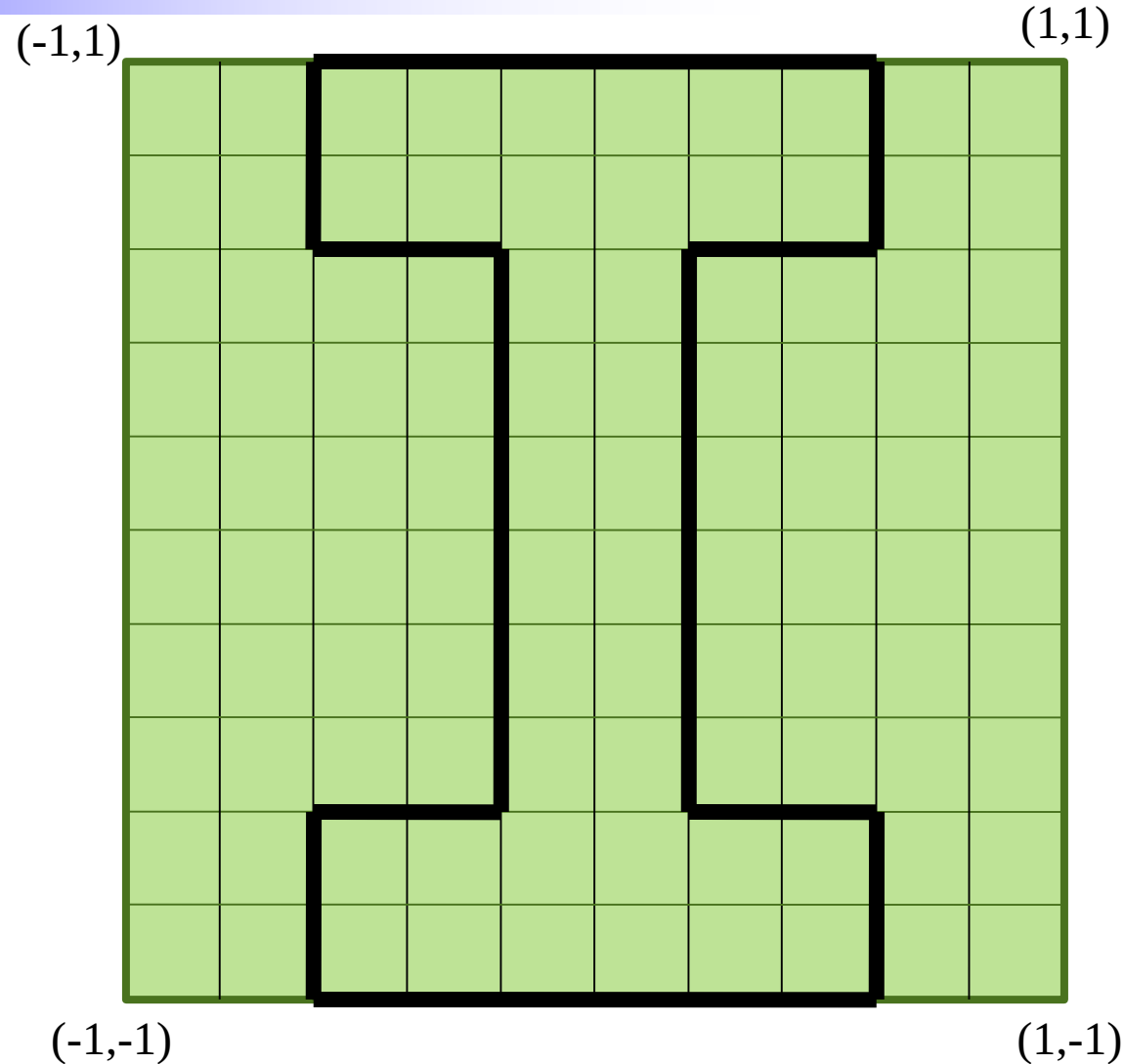
```
gl.drawArrays(  
    gl.LINE_STRIP, ...)
```



Line Loop

```
[ -0.6,  1.0,  
  -0.6,  0.6,  
  -0.2,  0.6,  
  -0.2, -0.6,  
  -0.6, -0.6,  
  -0.6, -1.0,  
   0.6, -1.0,  
   0.6, -0.6,  
   0.2, -0.6,  
   0.2, -0.6,  
   0.6,  0.6,  
   0.6,  1.0  
];
```

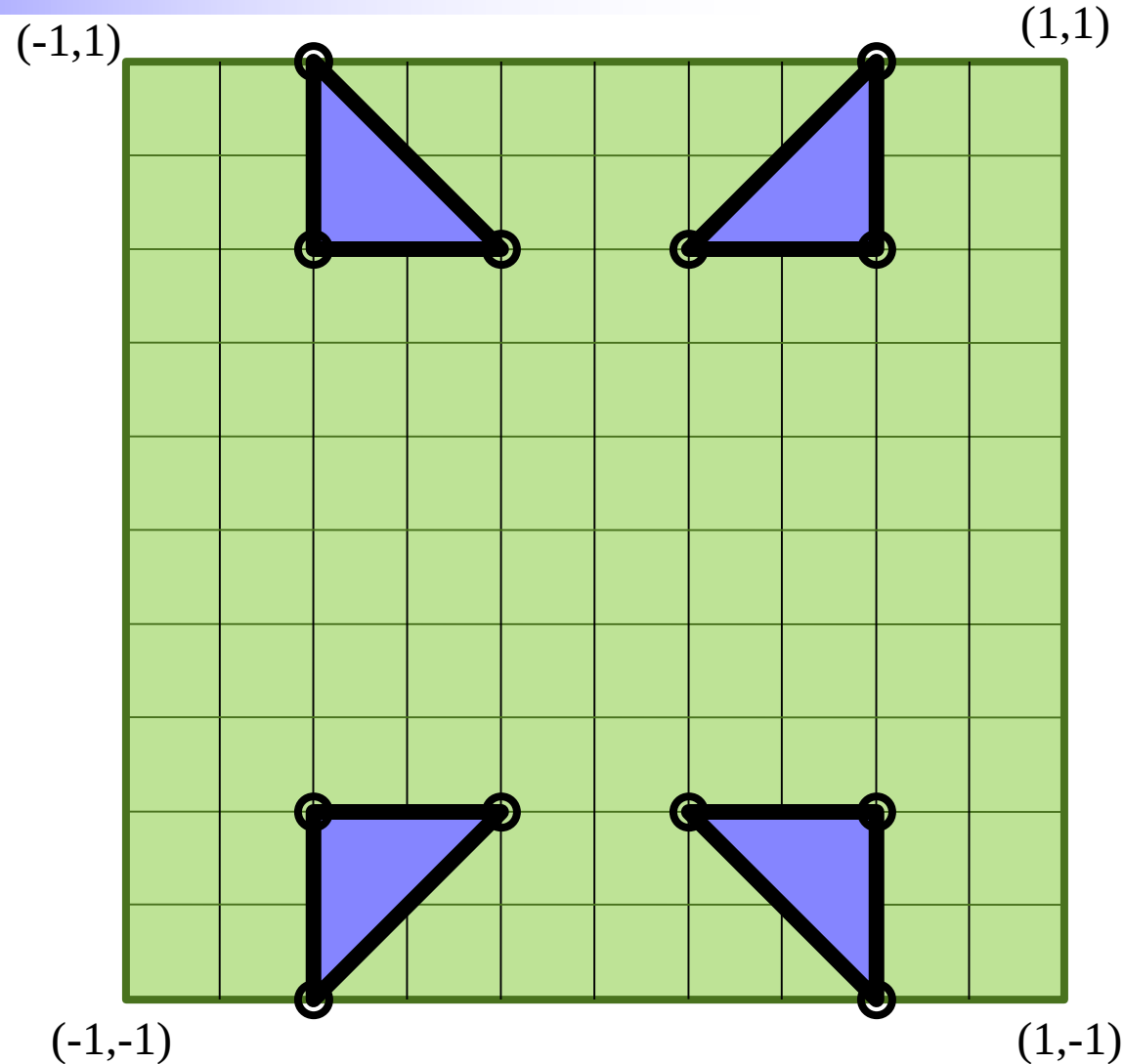
```
gl.drawArrays(  
    gl.LINE_LOOP, ...)
```



Triangles

```
[ -0.6,  1.0,  
  -0.6,  0.6,  
  -0.2,  0.6,  
  -0.2, -0.6,  
  -0.6, -0.6,  
  -0.6, -1.0,  
   0.6, -1.0,  
   0.6, -0.6,  
   0.2, -0.6,  
   0.2, -0.6,  
   0.6,  0.6,  
   0.6,  1.0];
```

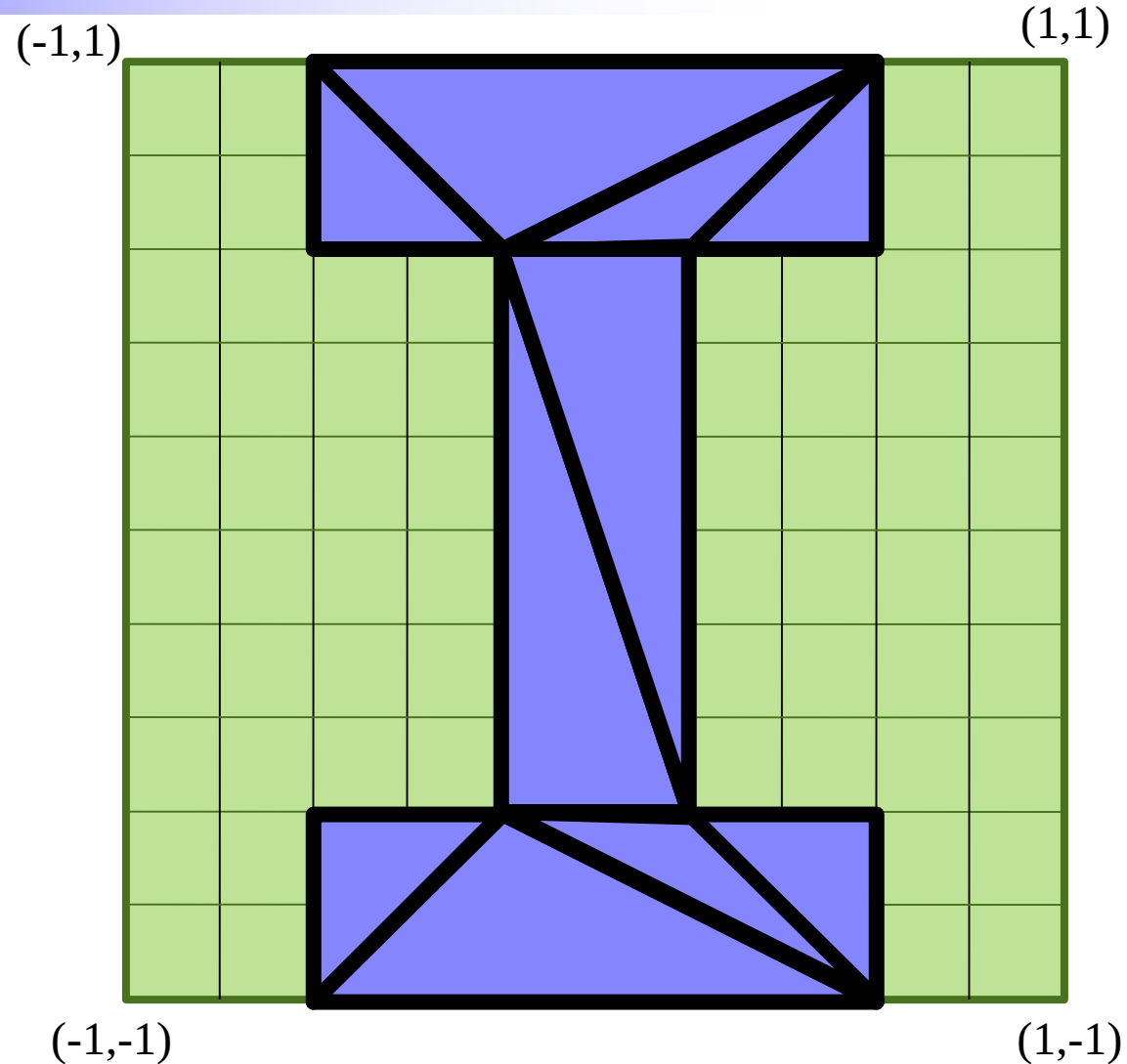
```
gl.drawArrays(  
    gl.TRIANGLES, ...)
```



Triangles

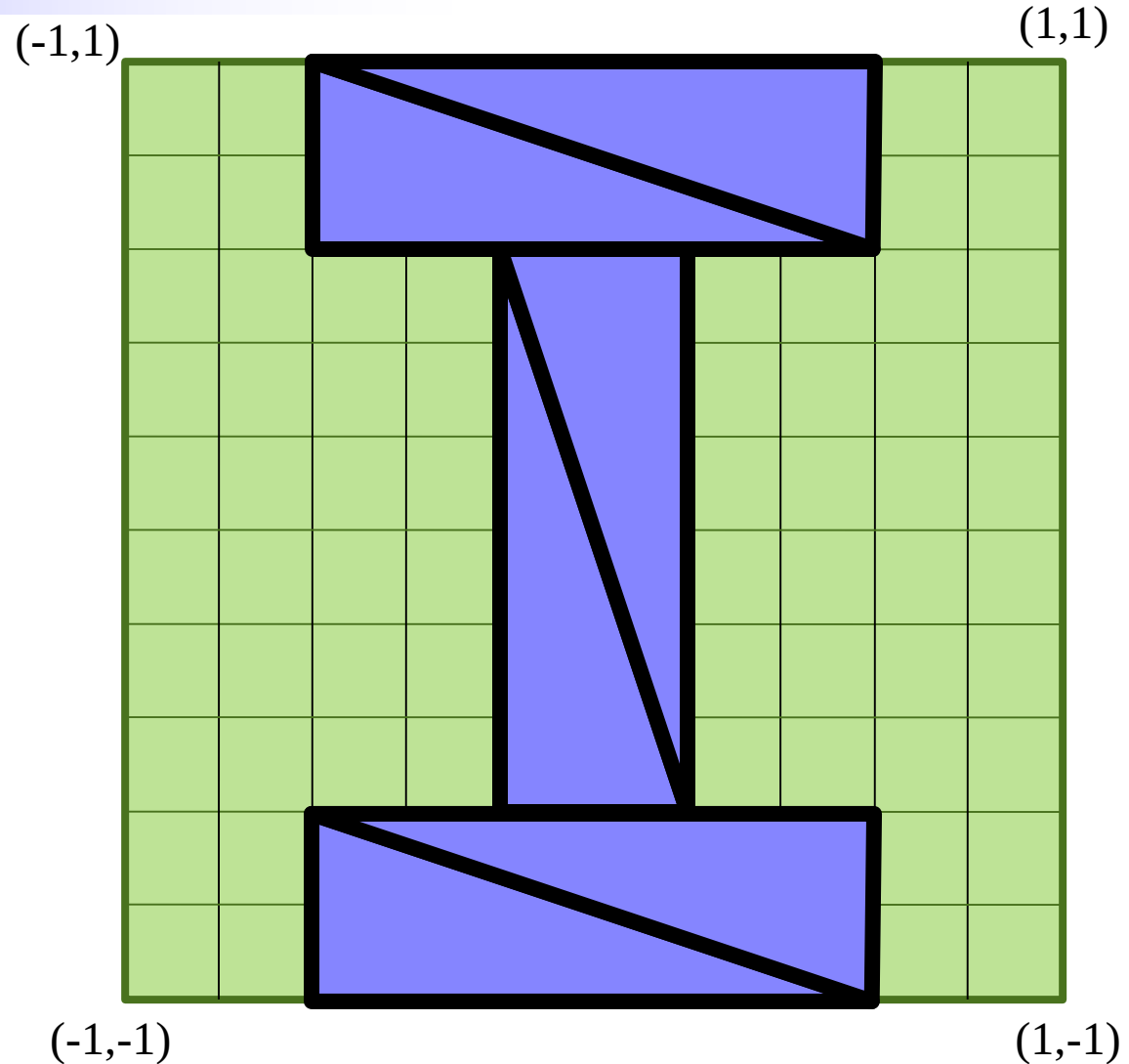
```
[ -0.6,  1.0,  
  -0.6,  0.6,  
  -0.2,  0.6,  
  -0.6,  1.0,  
  -0.2,  0.6,  
   0.6,  1.0,  
  -0.2,  0.6,  
   0.2,  0.6,  
   0.6,  1.0,  
   0.2,  0.6,  
   0.6,  0.6,  
   0.6,  1.0,  
...];
```

```
gl.drawArrays(  
    gl.TRIANGLES, ...)
```



No T Vertices!

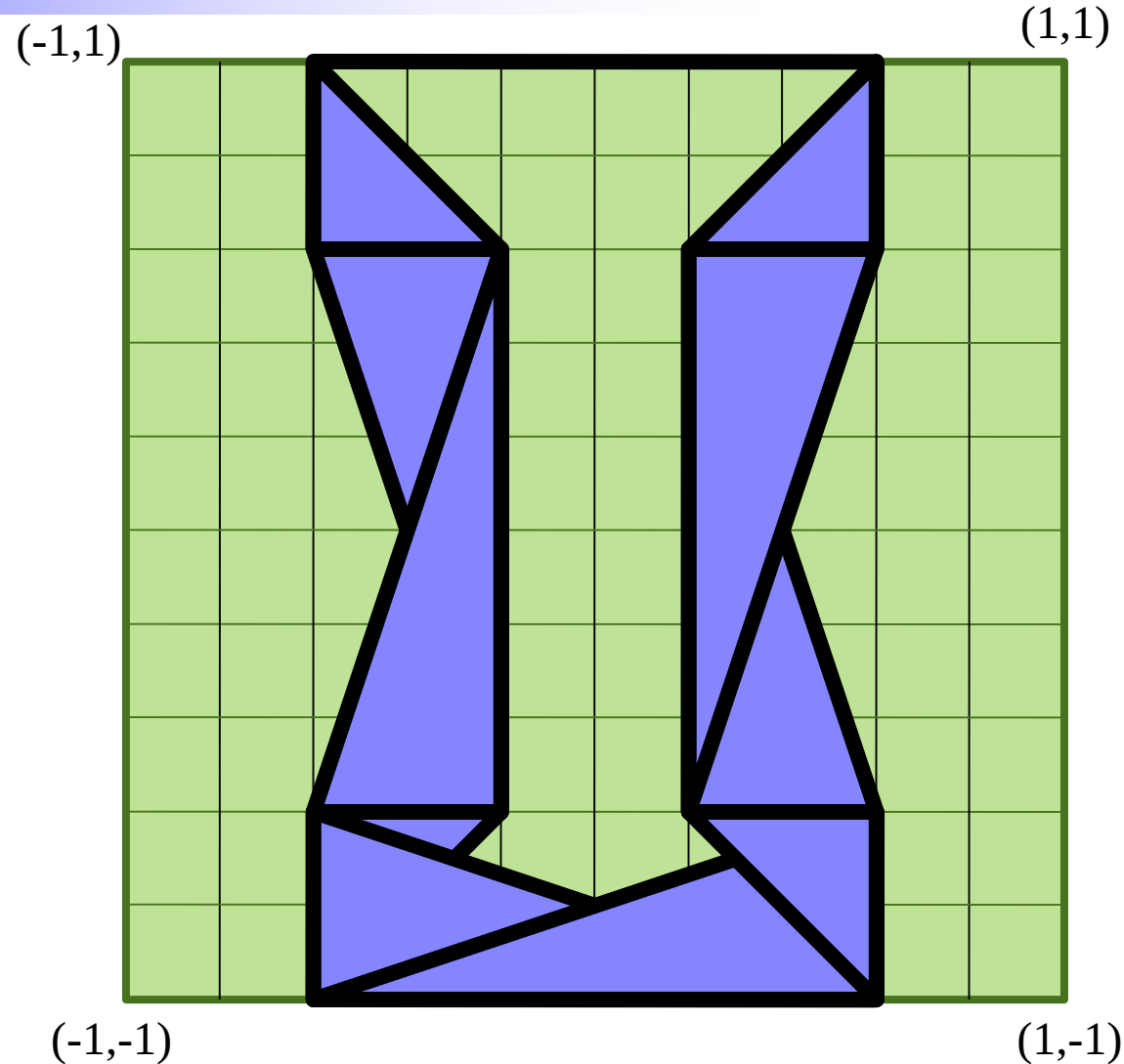
Triangle edges should
NEVER
pass through a
neighboring vertex



Triangle Strip

```
[ -0.6,  1.0,  
  -0.6,  0.6,  
  -0.2,  0.6,  
  -0.2, -0.6,  
  -0.6, -0.6,  
  -0.6, -1.0,  
   0.6, -1.0,  
   0.6, -0.6,  
   0.2, -0.6,  
   0.2, -0.6,  
   0.6,  0.6,  
   0.6,  1.0];
```

```
gl.drawArrays(  
    gl.TRIANGLE_STRIP, ...)
```

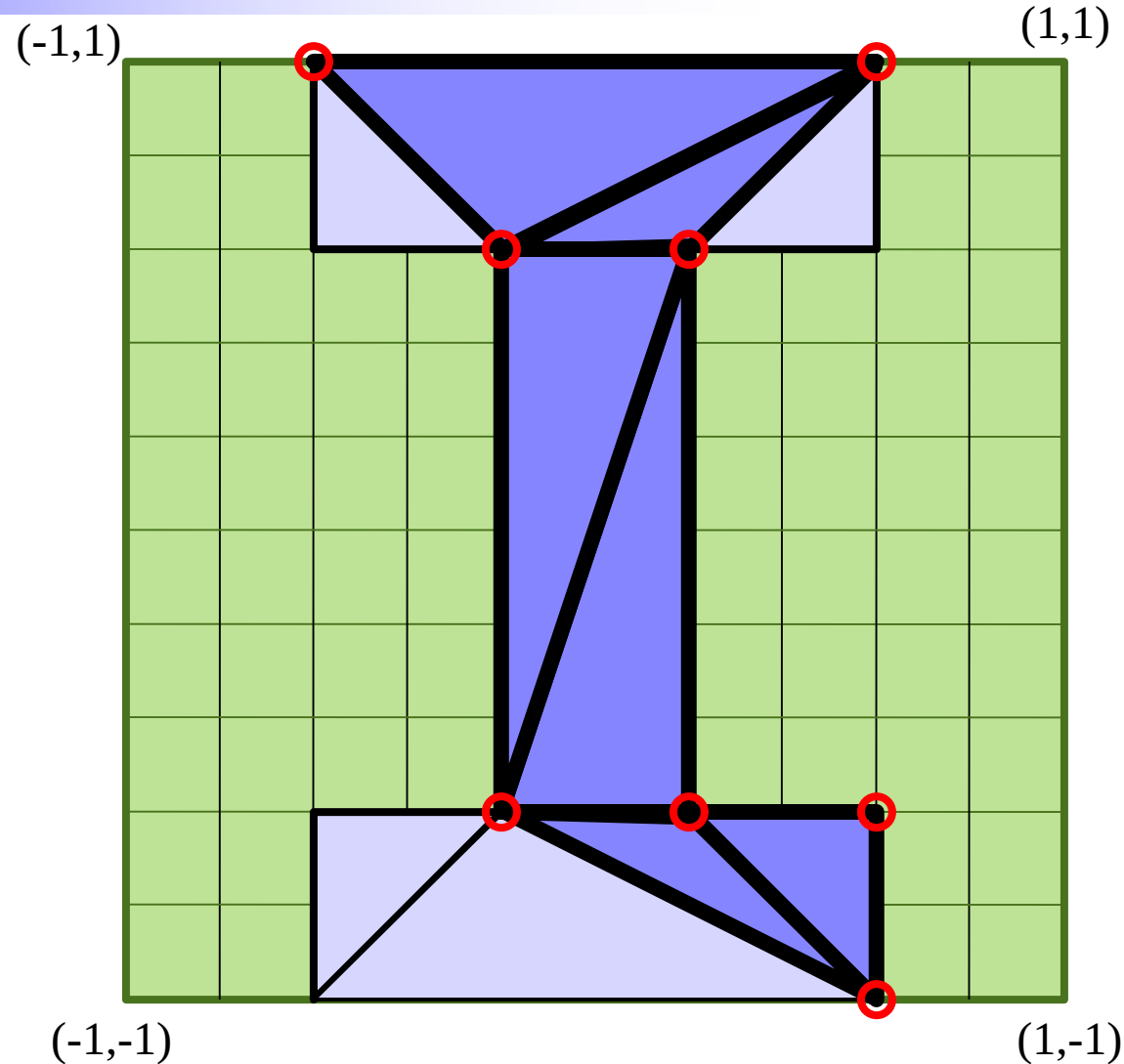


Triangle Strip

First two vertices prime the pump,
then every new vertex creates a triangle
connecting it to the previous two vertices

```
[ -0.6,  1.0,  
  0.6,  1.0,  
 -0.2,  0.6,  
  0.2,  0.6,  
 -0.2, -0.6,  
  0.2, -0.6,  
  0.6, -1.0,  
  0.6, -0.6];  
[...];
```

```
gl.drawArrays(  
    gl.TRIANGLE_STRIP, ...)
```

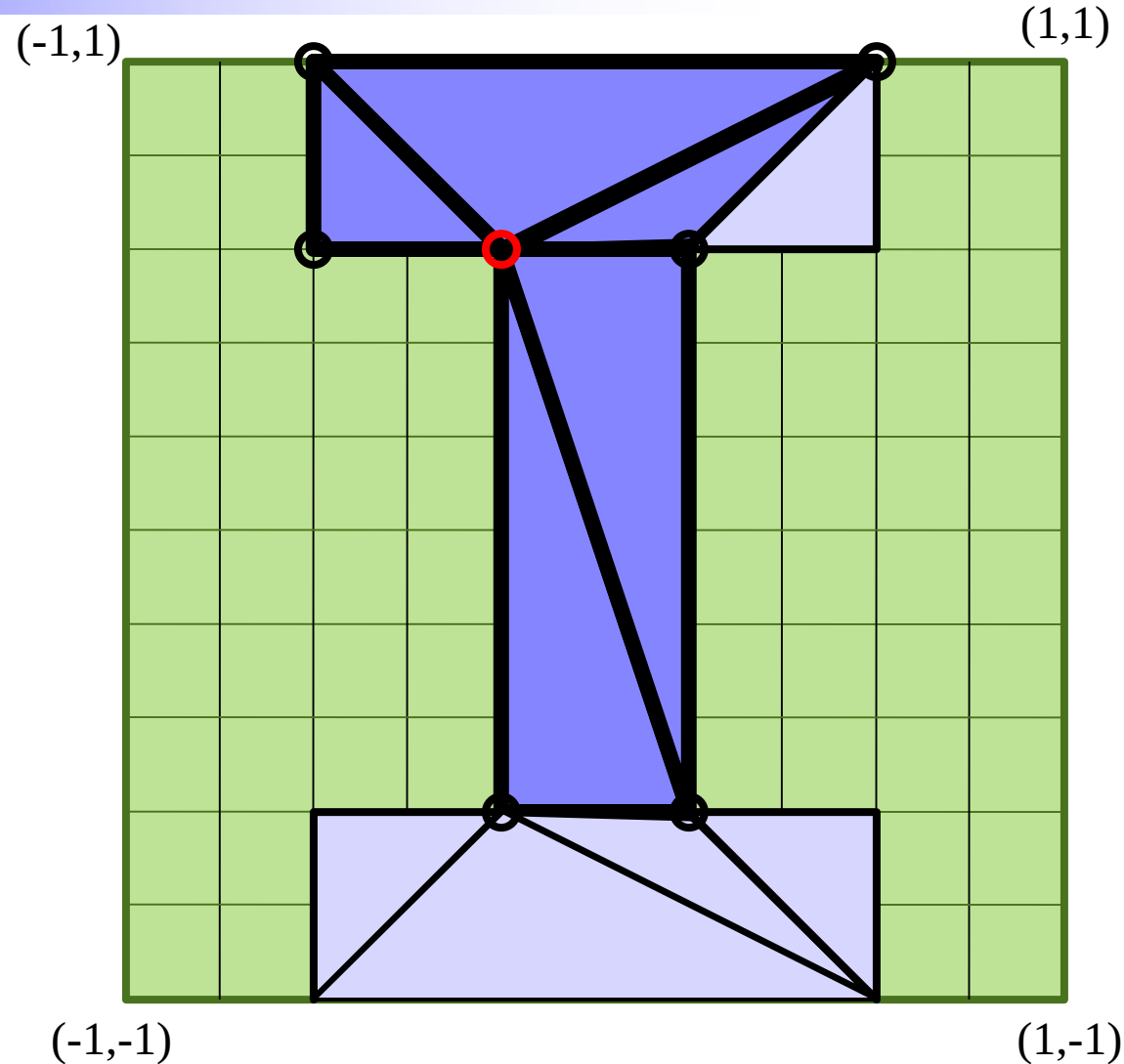


Triangle Fan

First two vertices prime the pump,
then every new vertex creates a triangle
connecting it to the previous vertex and
the first vertex

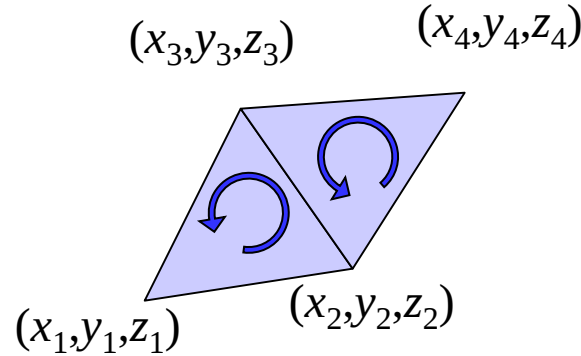
```
[ -0.2,  0.6,  
  -0.6,  0.6,  
  -0.6,  1.0,  
   0.6,  1.0,  
   0.2,  0.6,  
   0.2, -0.6,  
  -0.2, -0.6];  
[...]; [...]; [...];
```

```
gl.drawArrays(  
    gl.TRIANGLE_FAN, ...)
```



Indexed Face Set

- Popular file format
 - VRML, Wavefront “.obj”, etc.
- Ordered list of vertices
 - Prefaced by “v” (Wavefront)
 - Spatial coordinates x,y,z
 - Index given by order
- List of polygons
 - Prefaced by “f” (Wavefront)
 - Ordered list of vertex indices
 - Length = # of sides
 - Orientation given by order



```
v x1 y1 z1
v x2 y2 z2
v x3 y3 z3
v x4 y4 z4

f 1 2 3
f 2 4 3
```