Polygon Filling

Contents

Polygon Filling

- Filling a Polygon is the process of coloring every pixel that comes inside the Polygon region.
- Techniques:
  - ✓ Boundary Fill Method
  - ✓ Flood Fill Method
  - ✓ Scan – Line Fill Method

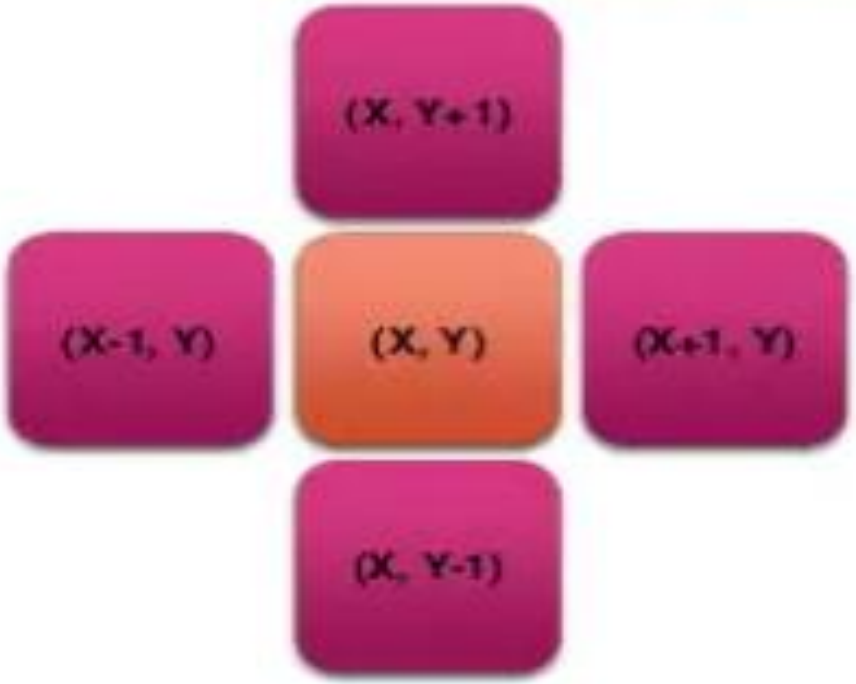
Boundary Fill Method

- Also known as *"Seed-Fill Method"*
- ✓ Draw Polygon boundaries
- ✓ Fill up the seed point
- ✓ A *Seed-Point* i.e. an arbitrary interior point is taken as the initial or the starting point.
- ✓ Test neighboring pixels to determine whether they correspond to the boundary pixel
- ✓ If not, paint them with the fill-color and test their neighboring pixels

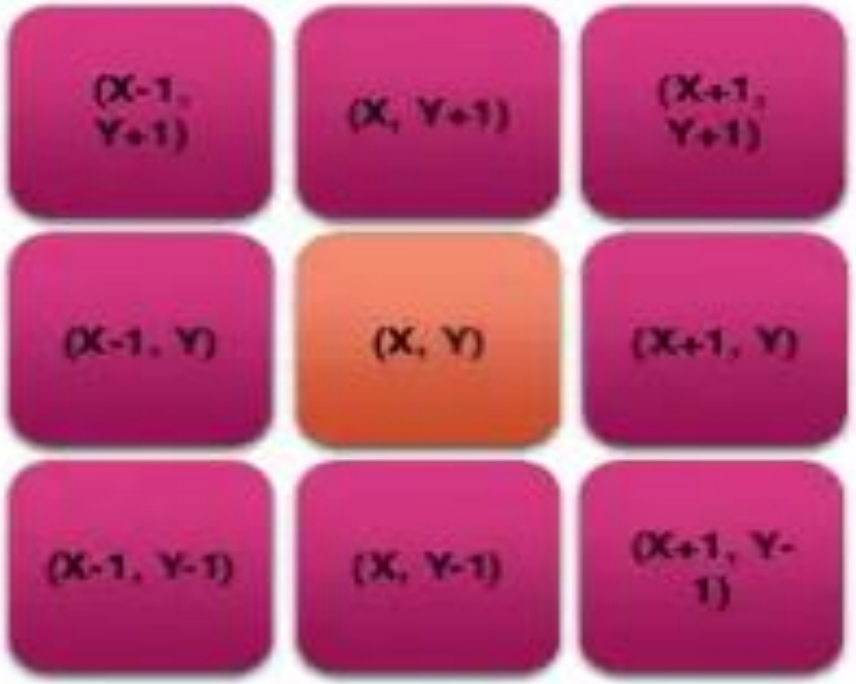
  (store neighbors in stack)
- ✓ Continue until all pixels have been tested

- ✓ A considerable stack is used to store pixel information.
- ✓ Basically, it is of two types :
  1. 4-Connected Seed Fill
  2. 8-Connected Seed Fill

4-Connected and 8-Connected Seed

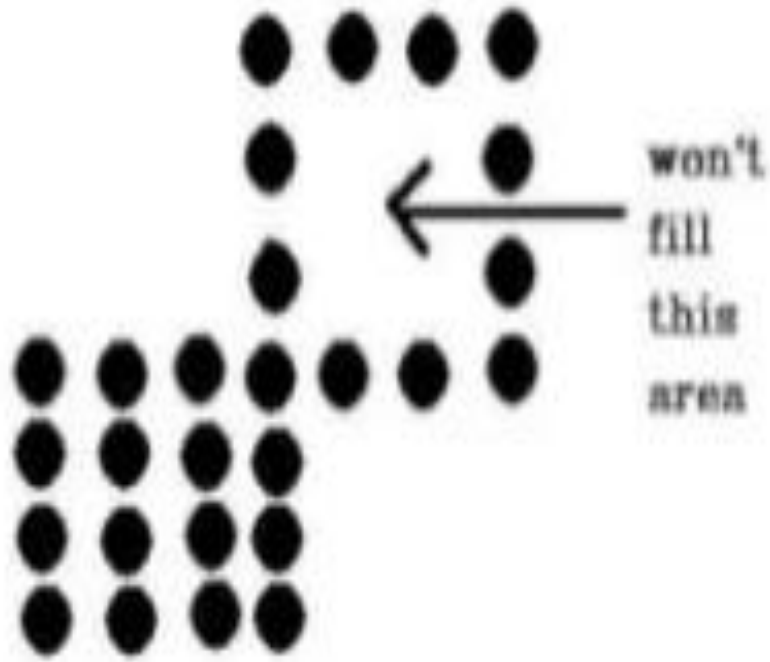


4-Connected

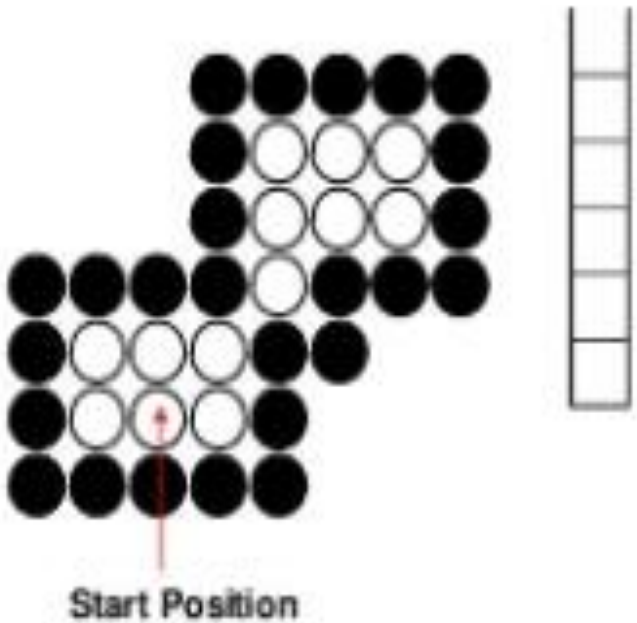


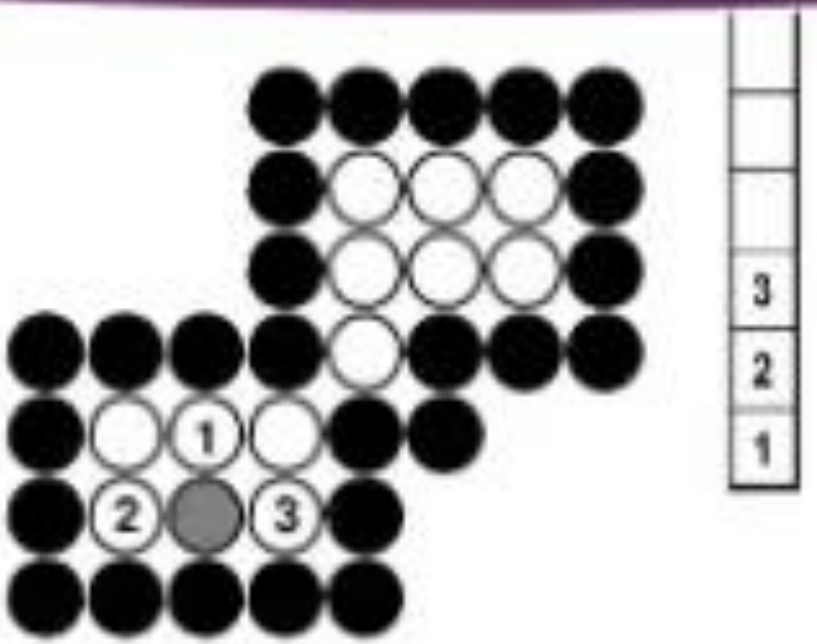
8-Connected

- The 4-connected pixel technique failed to fill the area as marked in the following figure which won't happen with the 8-connected technique.



4 – Connected Example

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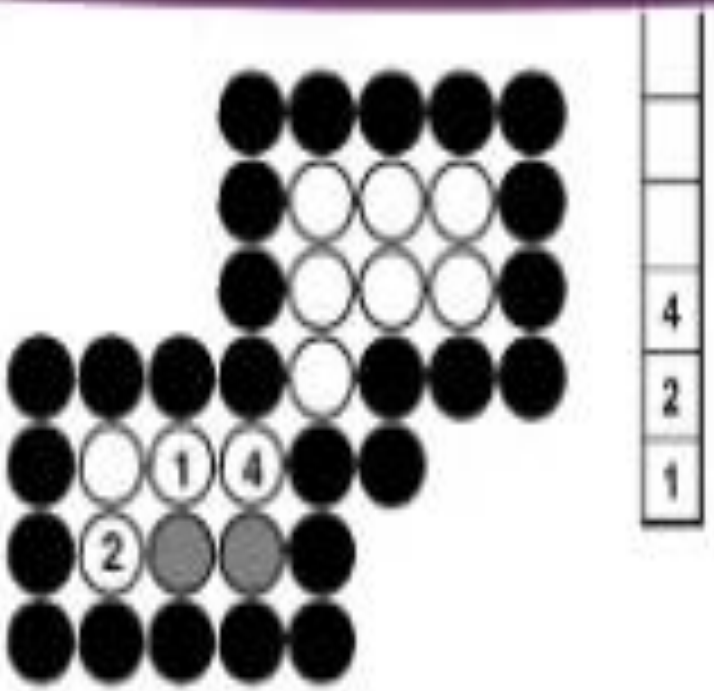
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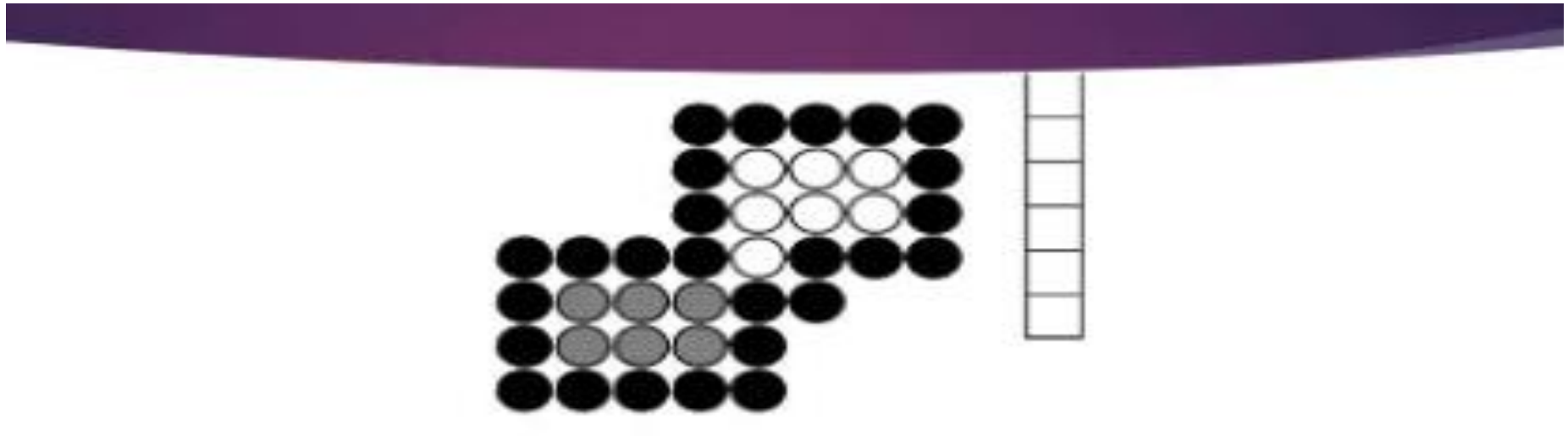
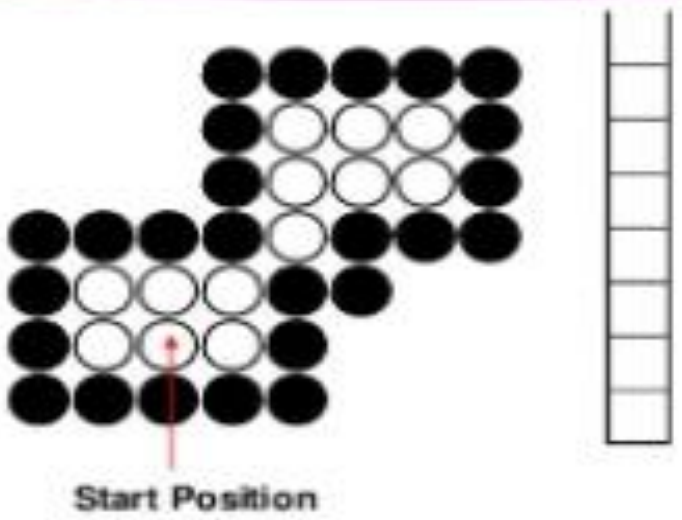
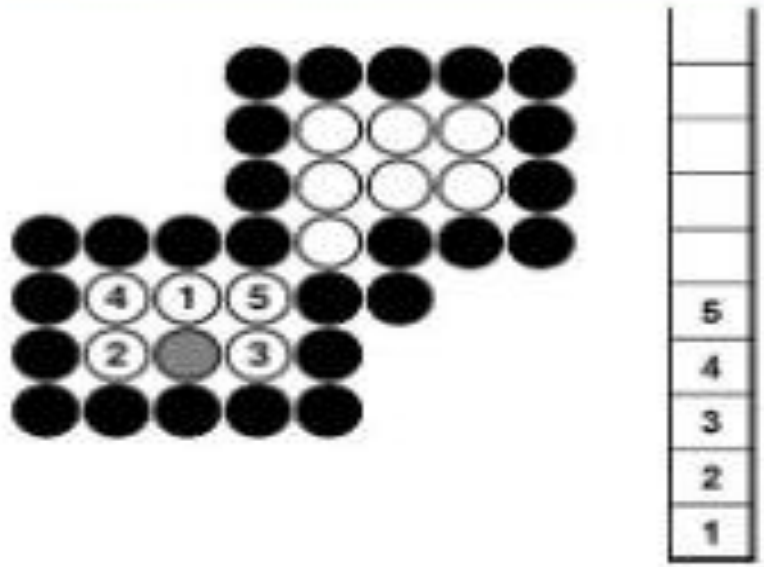


8 Connected Example

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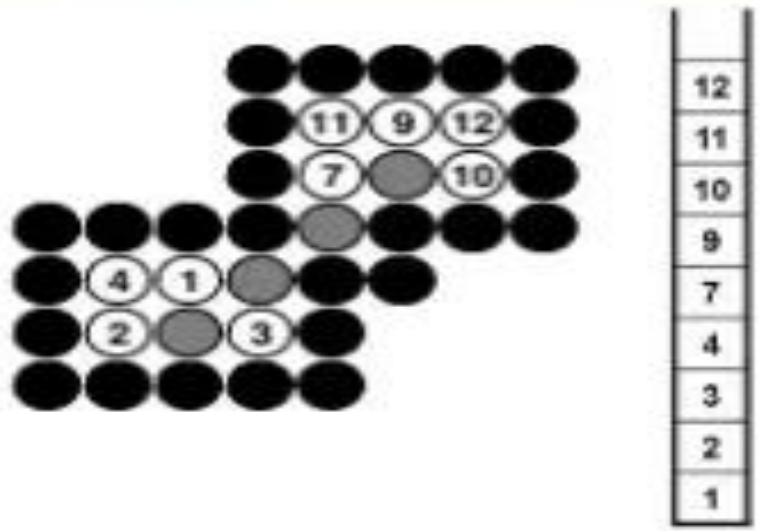
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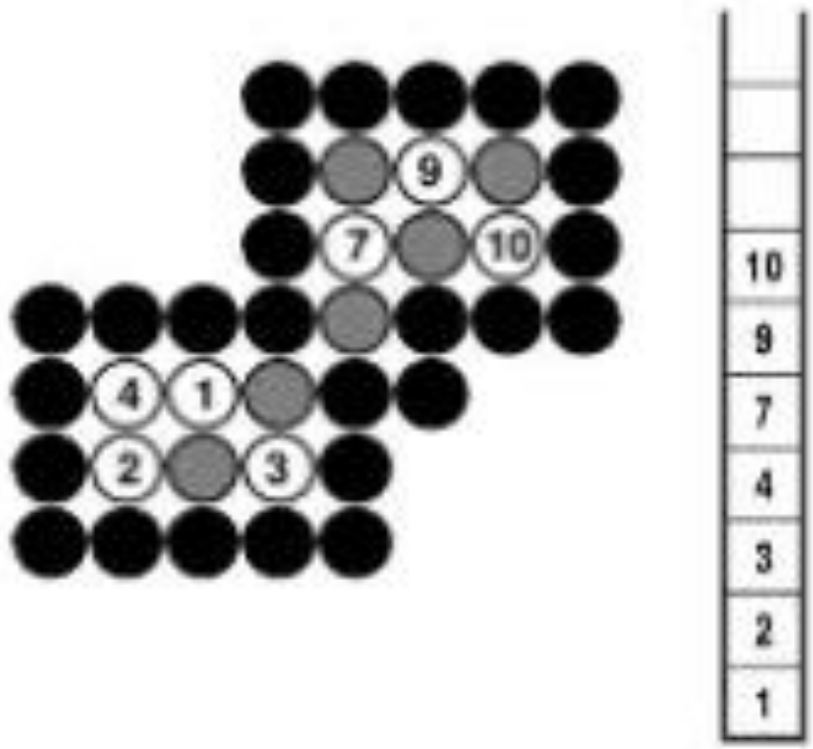
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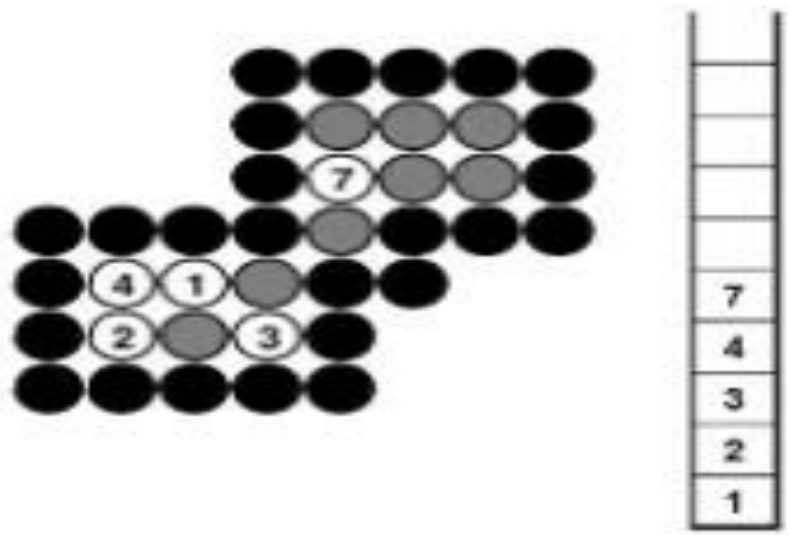
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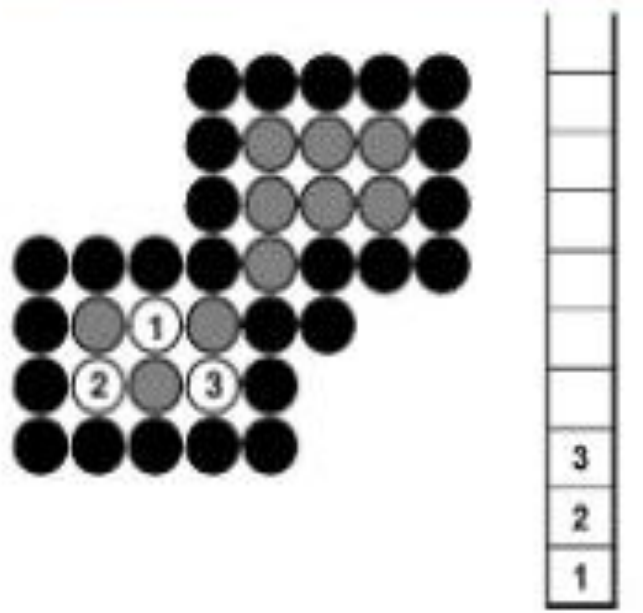
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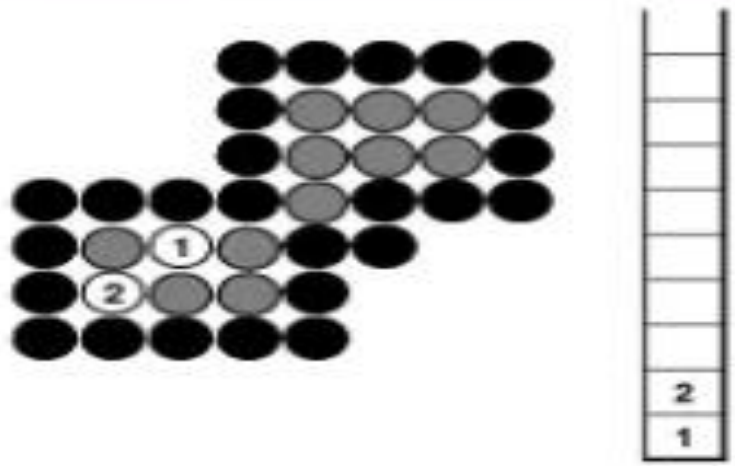
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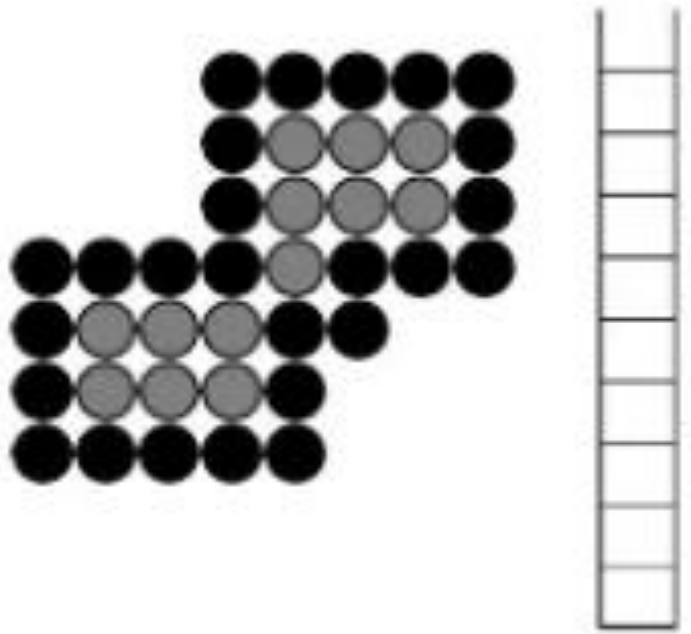


Flood Fill Method

- Modified form of *Boundary Fill Method.*
- Basic concept is just like Boundary Filling.
- Fill polygon starting with a "seed" point known to be inside the polygon & set the neighboring pixels until we encounter the boundary pixels.
- Polygon is filled just like pouring water in an empty bucket.
- Common example is the *bucket-fill* tool of MS-Paint.
- Like Boundary Fill Method, it is also used in games.

Filling Irregular Boundaries

- Boundary fill: expand and fill region until you reach boundary color

- •Flood fill: expand and fill region while you find interior color

- In brief:

• Flood Fill and Boundary Fill are algorithms used for colouring a given figure with a chosen colour

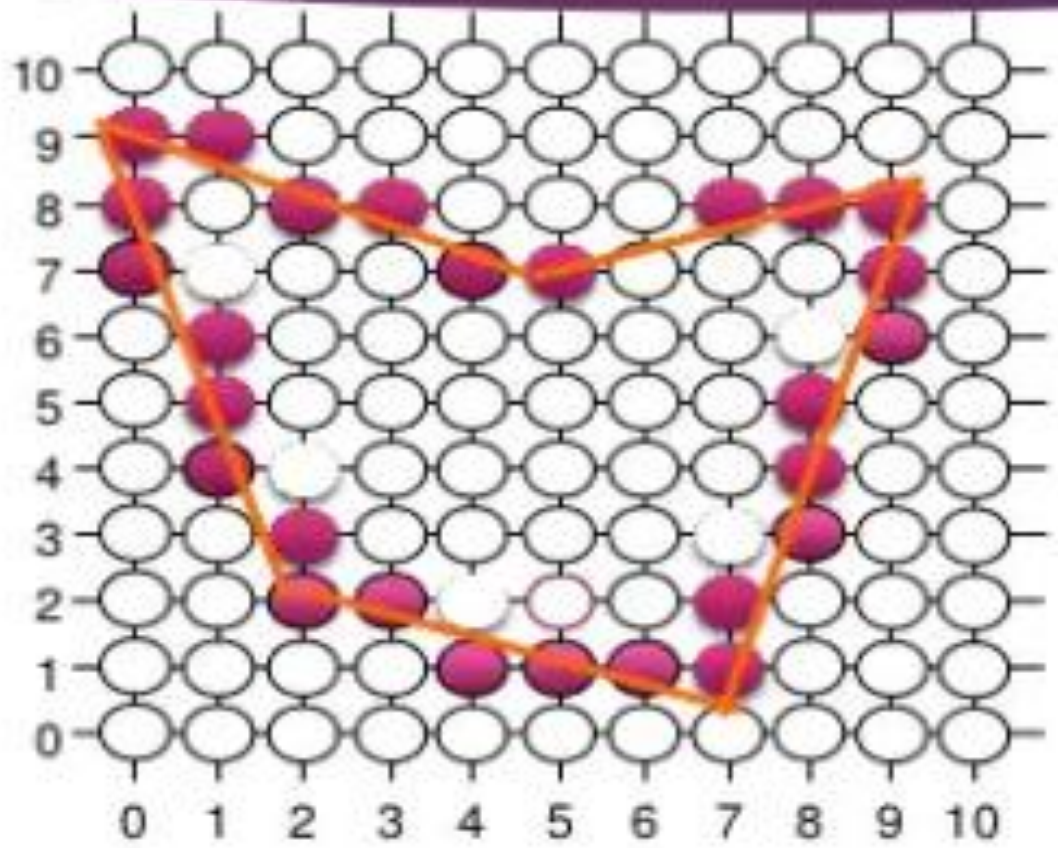
• Flood Fill is one in which all connected pixels of a selected colour get replaced by a fill colour.

• Boundary Fill is very similar with the difference being the program stopping when a given colour boundary is found.

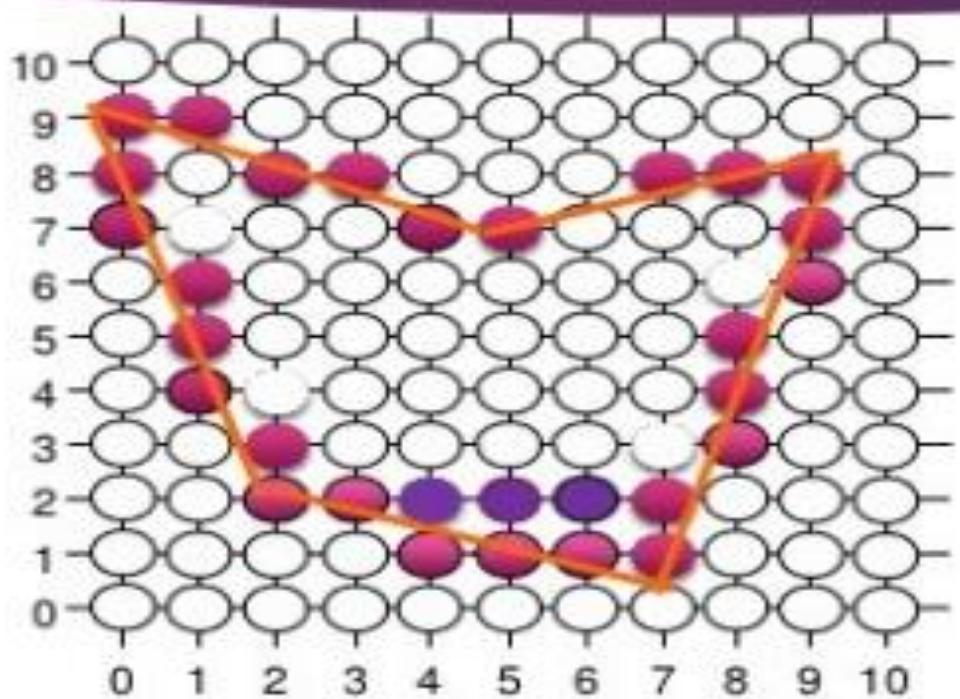
Scan - Line Fill Method

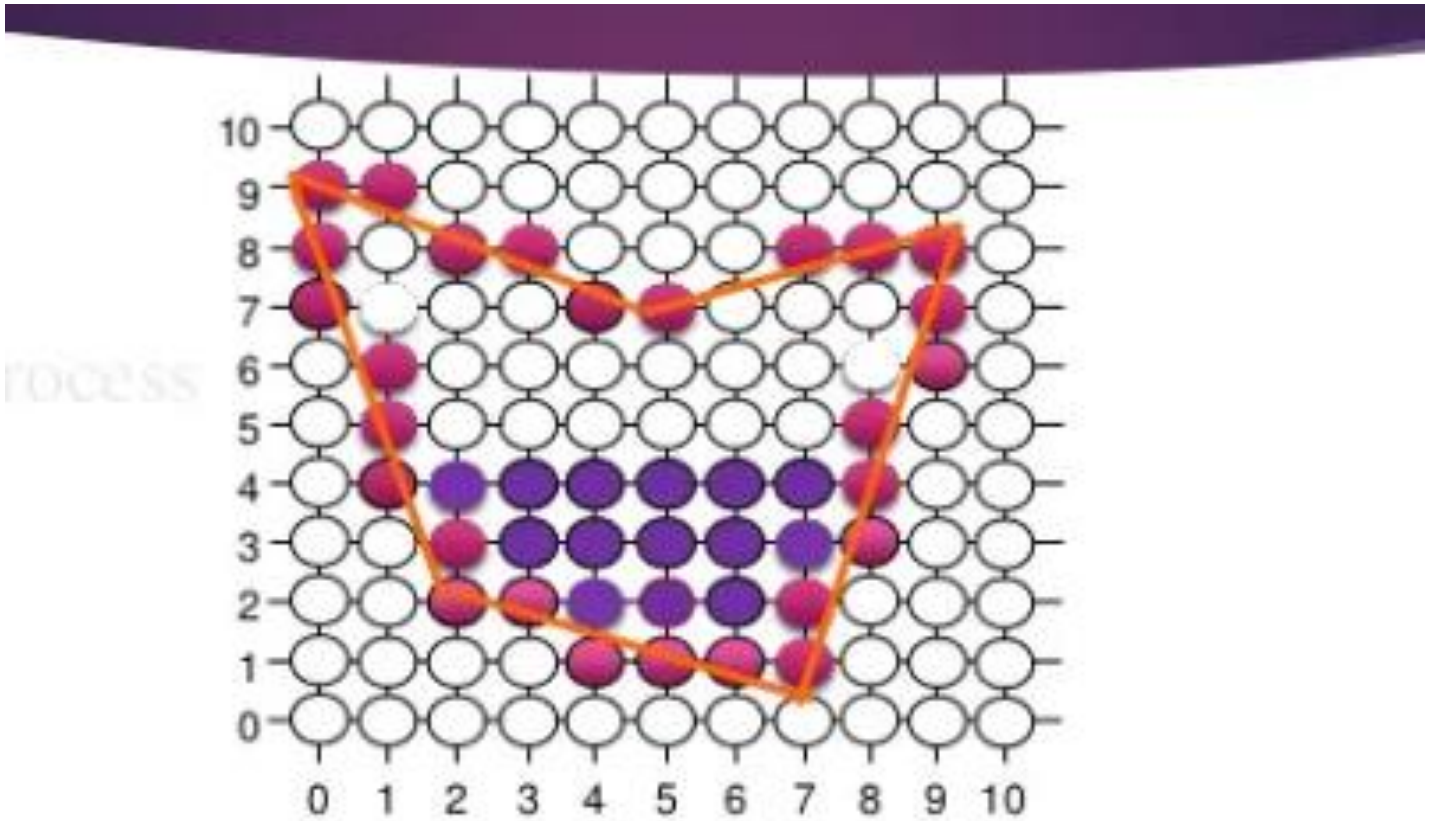
- Used in Raster Scan Devices.
- The scan-line algorithm works as follows:
  i. Find intersections of the scan-line with all edges
  ii. Sort intersections in increasing x
  iii. Fill all the pixels between pairs of intersections
- Special Cases to handle:
  i. Exclude horizontal edges
  ii. For vertices lying on scan-line
    - Count twice

Scan - Line Draw Polygon



Scan - Line Filling Process

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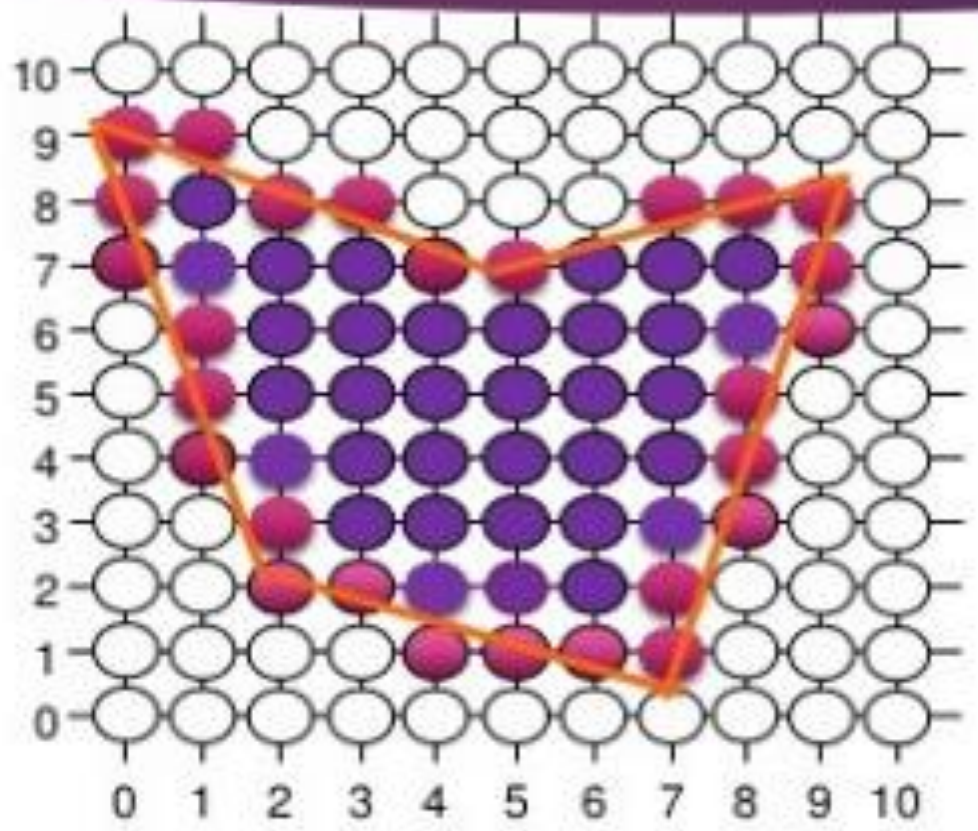
Scan - Line Filling Process

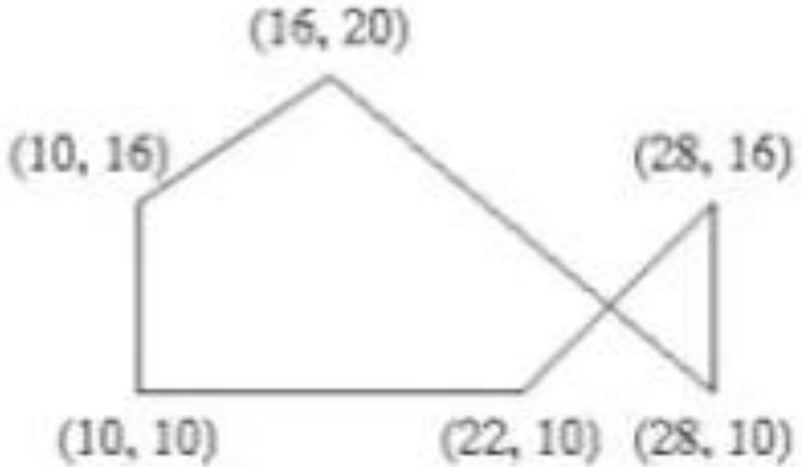


Example

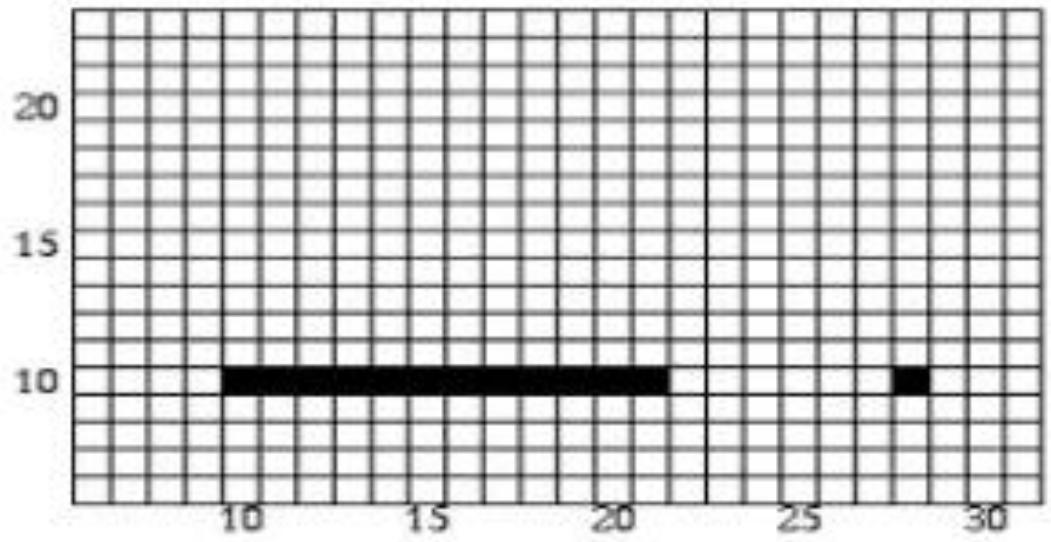
- Initially, each vertices of the polygon is given in the form of (x,y) and is in an ordered array as such:
- Unfilled, the polygon would look like this to the human eye:

ordered_vertices

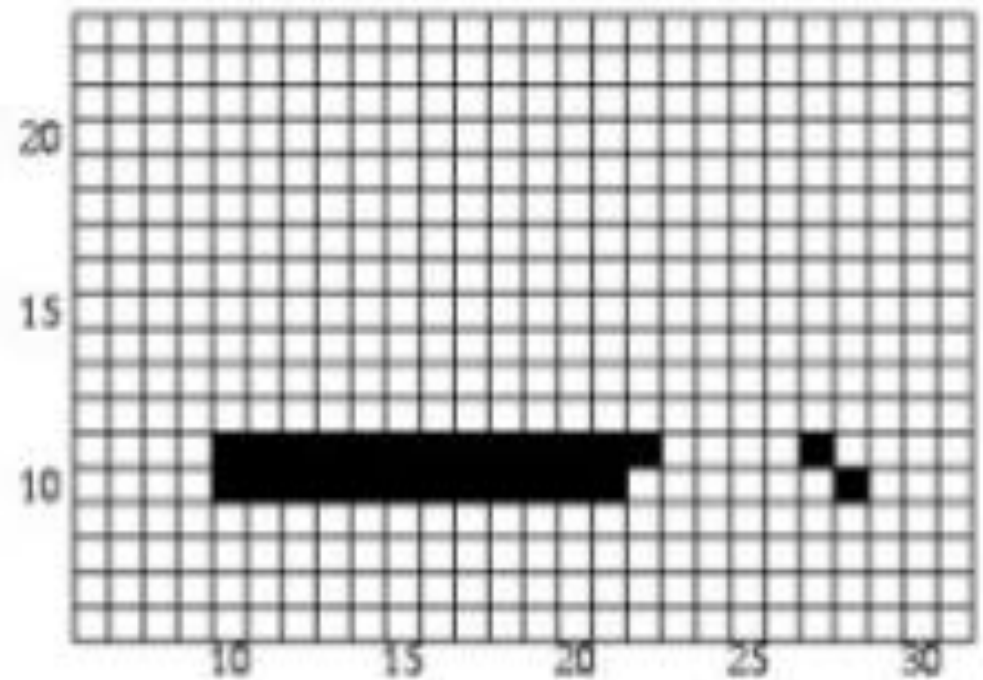
0	(10, 10)
1	(10, 16)
2	(16, 20)
3	(28, 10)
4	(28, 16)
5	(22, 10)

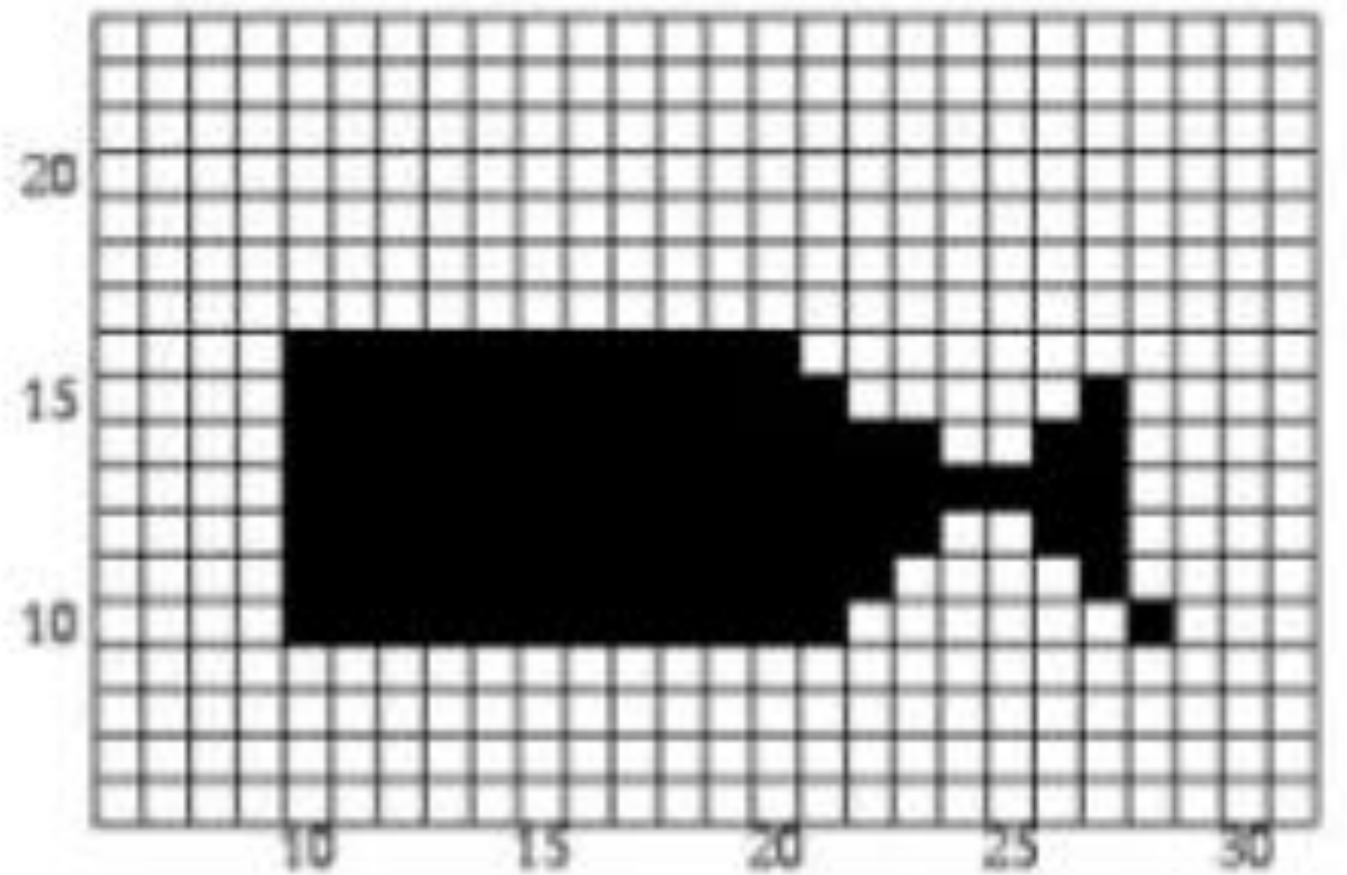


- The polygon is now filled as follows:



- The polygon is now filled as follows:

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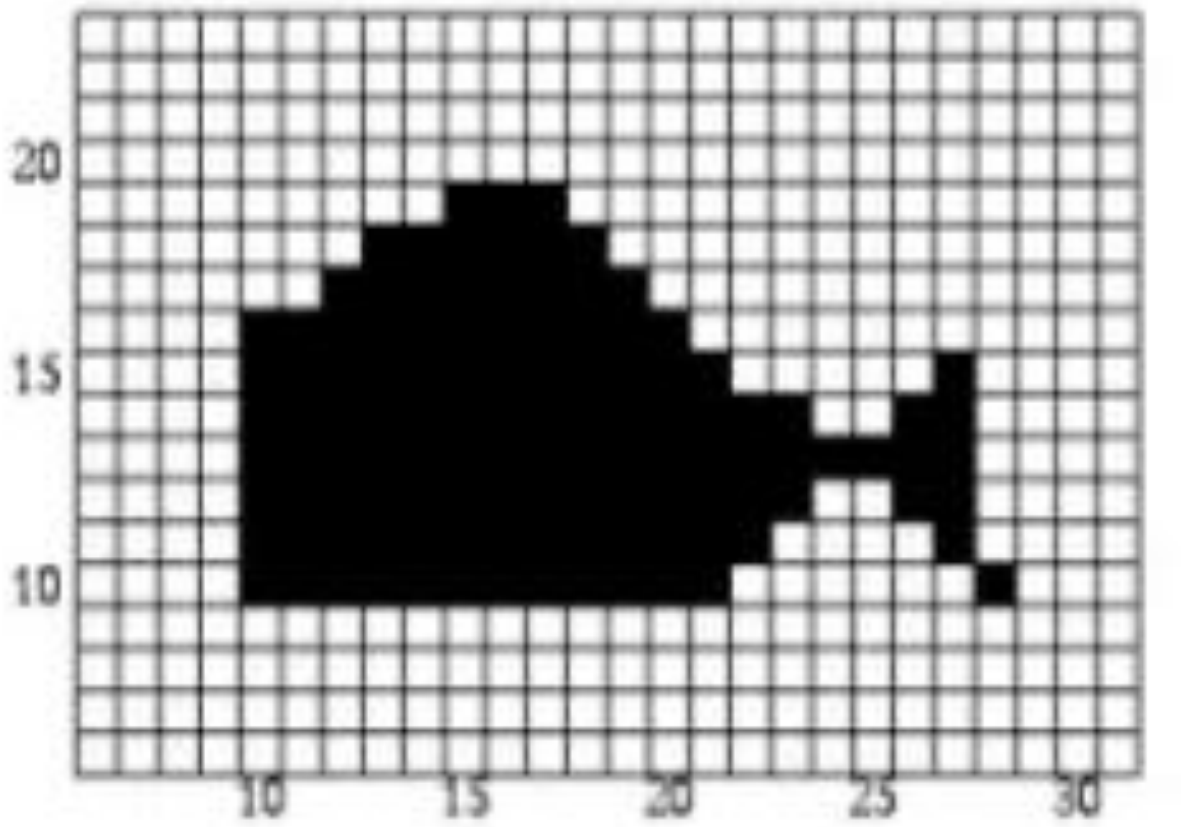
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- Now that we have filled the polygon, let's see what it looks like to the naked eye: