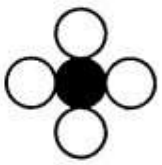
Experiment No.5
Aim: To implement Area Filling Algorithm: Boundary Fill, Flood Fill
Name:Nikhil Kamalaji Shingade
Roll no: 57
Date of Performance:
Date of Submission:

Experiment No. 5

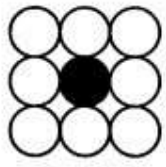
Aim: To implement Area Filling Algorithm: Boundary Fill, Flood Fill.

Objective:
Polygon is an ordered list of vertices as shown in the following figure. For filling polygons with particular colors, we need to determine the pixels falling on the border of the polygon and those which fall inside the polygon. Objective is to demonstrate the procedure for filling polygons using different techniques.

Theory:
1) Boundary Fill algorithm –
Start at a point inside a region and paint the interior outward toward the boundary. If the boundary is specified in a single color, the fill algorithm processed outward pixel by pixel until the boundary color is encountered. A boundary-fill procedure accepts as input the coordinate of the interior point (x, y), a fill color, and a boundary color.



(a) Four connected region



(b) Eight connected region

Procedure:

```
boundary_fill (x, y, f_color, b_color)
{ if (getpixel (x, y) != b_colour && getpixel (x, y) !=
f_colour)
        {
        putpixel (x, y, f_colour)
         boundary_fill (x + 1, y, f_colour, b_colour);
boundary_fill (x, y + 1, f_colour, b_colour);
         boundary_fill (x - 1, y, f_colour, b_colour);
         boundary_fill (x, y - 1, f_colour, b_colour);
        }
}
```

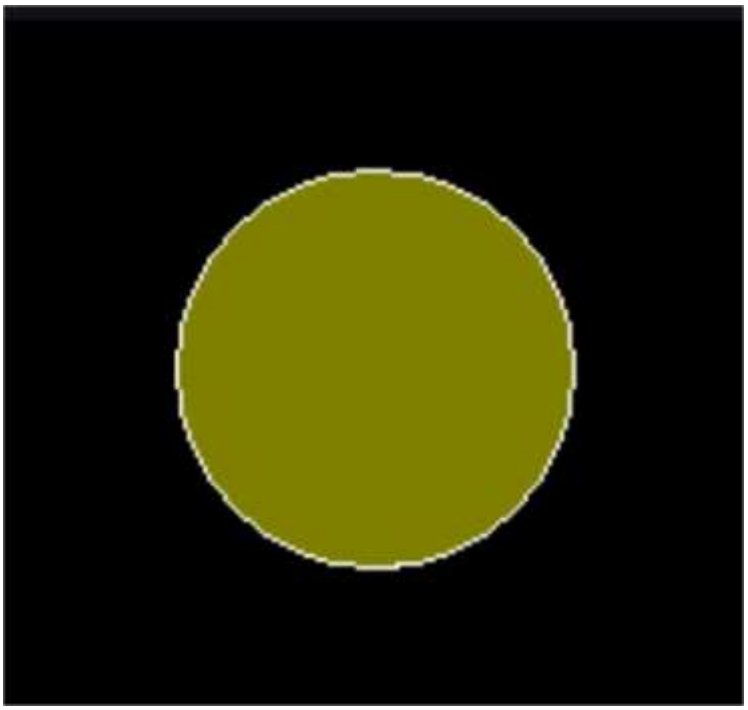
Program:

```
#include <stdio.h>

#include <graphics.h>

#include<dos.h>
```

```
void boundaryfill(int x,int y,int f_c,int b_c)
{
if (getpixel(x,y)!=b_c && getpixel(x,y)!=f_c)
        {
   putpixel(x,y,f_c);
         boundaryfill(x+1,y,f_c,b_c);
         boundaryfill(x,y+1,f_c,b_c);
         boundaryfill(x-1,y,f_c,b_c);
         boundaryfill(x,y-1,f_c,b_c);
        }
}
 Int
main()
{
        int gm,gd=DETECT,radius,x,y;
 printf("Enter x and y co-ordinates for cicle : ");
scanf("%d %d",&x,&y);
printf("Enter radius of the circle : ");
         scanf("%d",&radius);
initgraph(&gd,&gm," ");
circle(x,y,radius);
   rectangle(100,100,200,200);
printf("Enter the value of x and y : ");
scanf("%d %d",&x,&y);
boundaryfill(x,y,5,15);
```

```
delay(5000);
        closegraph();
        return 0;
}
```

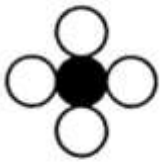
Output:



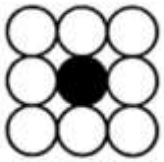
2) Flood Fill algorithm –

Sometimes we want to fill an area that is not defined within a single color boundary. We paint such areas by replacing a specified interior color instead of searching for a boundary color value. This approach is called a flood-fill algorithm.

1. We start from a specified interior pixel (x, y) and reassign all pixel values that are currently set to a given interior color with the desired fill color.
2. If the area has more than one interior color, we can first reassign pixel values so that all interior pixels have the same color.
3. Using either 4-connected or 8-connected approach, we then step through pixel positions until all interior pixels have been repainted.



(a) Four connected region



(b) Eight connected region

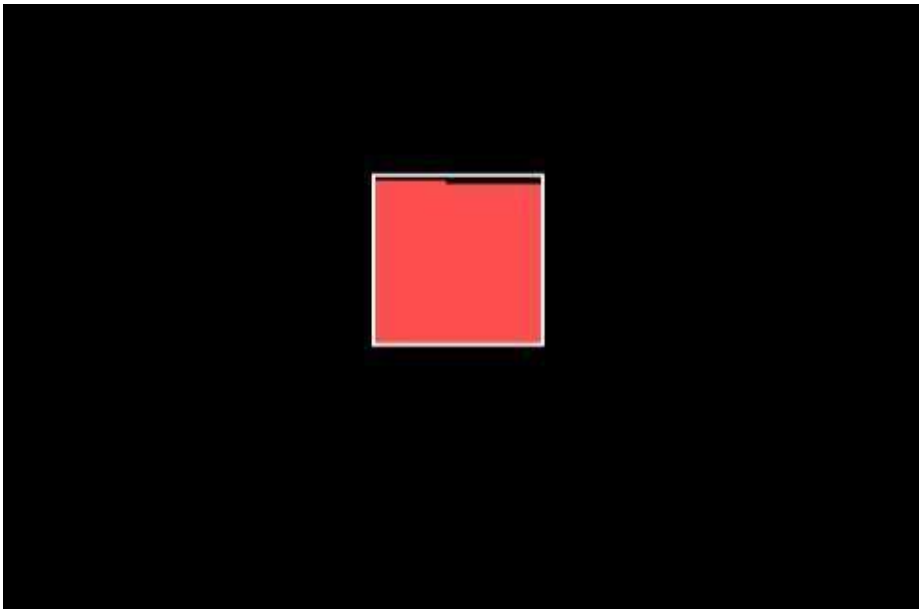
```
Procedure - flood_fill (x, y,
old_color, new_color)
{ if (getpixel (x, y) =
old_colour)
        {
        putpixel (x, y, new_colour);     flood_fill (x +
1, y, old_colour, new_colour);           flood_fill (x - 1,
y, old_colour, new_colour);     flood_fill (x, y + 1,
old_colour, new_colour);        flood_fill (x, y - 1,
old_colour, new_colour);        flood_fill (x + 1, y + 1,
old_colour, new_colour);        flood_fill (x - 1, y - 1,
old_colour, new_colour);        flood_fill (x + 1, y - 1,
old_colour, new_colour);        flood_fill (x - 1, y + 1,
old_colour, new_colour);
        }
}
```

Program:

```
#include<stdio.h>

#include<graphics.h>

#include<dos.h>

void flood(int,int,int,int);

int main()

{

int gd,gm=DETECT;

detectgraph(&gd,&gm);

initgraph(&gd,&gm," ");

rectangle(50,50,100,100);

flood(55,55,12,0);
```

```
closegraph();
return 0;
}
 void flood(int x,int y, int fill_col, int
old_col)
{
if(getpixel(x,y)==old_col)
{ delay(10); putpixel(x,y,fill_col);
flood(x+1,y,fill_col,old_col);
flood(x-1,y,fill_col,old_col);
flood(x,y+1,fill_col,old_col);
flood(x,y-1,fill_col,old_col);
flood(x + 1, y + 1, fill_col,
old_col); flood(x - 1, y - 1, fill_col,
old_col); flood(x + 1, y - 1,
fill_col, old_col); flood(x - 1, y +
1, fill_col, old_col);
}
}
```

Output:



Conclusion: Comment on

1. **Importance of Flood fill**

Flood fill is a critical algorithm in computer graphics and image processing. It helps in fillin g connected regions with a specified color, much like a paint bucket tool in graphics softwa re. This is essential for:
Coloring Areas: Filling bounded areas in vector graphics or raster graphics.
Image Processing: Segmenting regions in medical imaging, satellite imagery, etc.
Game Development: Implementing features like map exploration and area highlighting.

2. **Limitation of methods**

Flood fill methods, particularly the recursive approach, come with limitations:
Stack Overflow: Recursive flood fills can cause stack overflow on large regions due to deep recursion.
Performance: Can be slow for large areas or highly detailed boundaries.
Memory Usage: Can consume significant memory, especially if not optimized.

3. **Usefulness of method**

Despite its limitations, flood fill remains useful:
Versatility: Can be applied in various fields like graphics design, GIS, and gaming.
Simplicity: Easy to implement and understand.
Effectiveness: Quickly fills connected regions, making it suitable for numerous practical ap plications.