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Experiment A-3

Aim:
Write the program to draw the following pattern. Use DDA and Bresenham's Line drawing algorithm.

Algorithm :

1). Read the coordinates of the vertex of the triangle as x1,y1 and the length of sides of the triangle as l.
2). Read the other vertex of the triangle as x2,y2 & x3,y3.
3). The other vertices will be calculated as :-

X2=x1 + l/2
Y2 = y1 +(3^1/2)/2*l/2

X3 = x1 – l/2
Y3 = y2

4). Draw a line joining all the vertices forming a triangle.
5). Let xl,yl be base of the altitude,

X1 = (x2 +x3)/2
Y1 = y2 = y3

6). Let (xr,yr) be the center of the incircle and circumcircle.

Xr = (2*xl +x3)/3

Yr = (2*yl +y3)/3

7). Let r1 and r2 be the radius of incircle and circumcircle simultaneously.

R1 = (((x1-x2)^2 +(y1-y2)^2)^1/2)

R2 = 2*r1

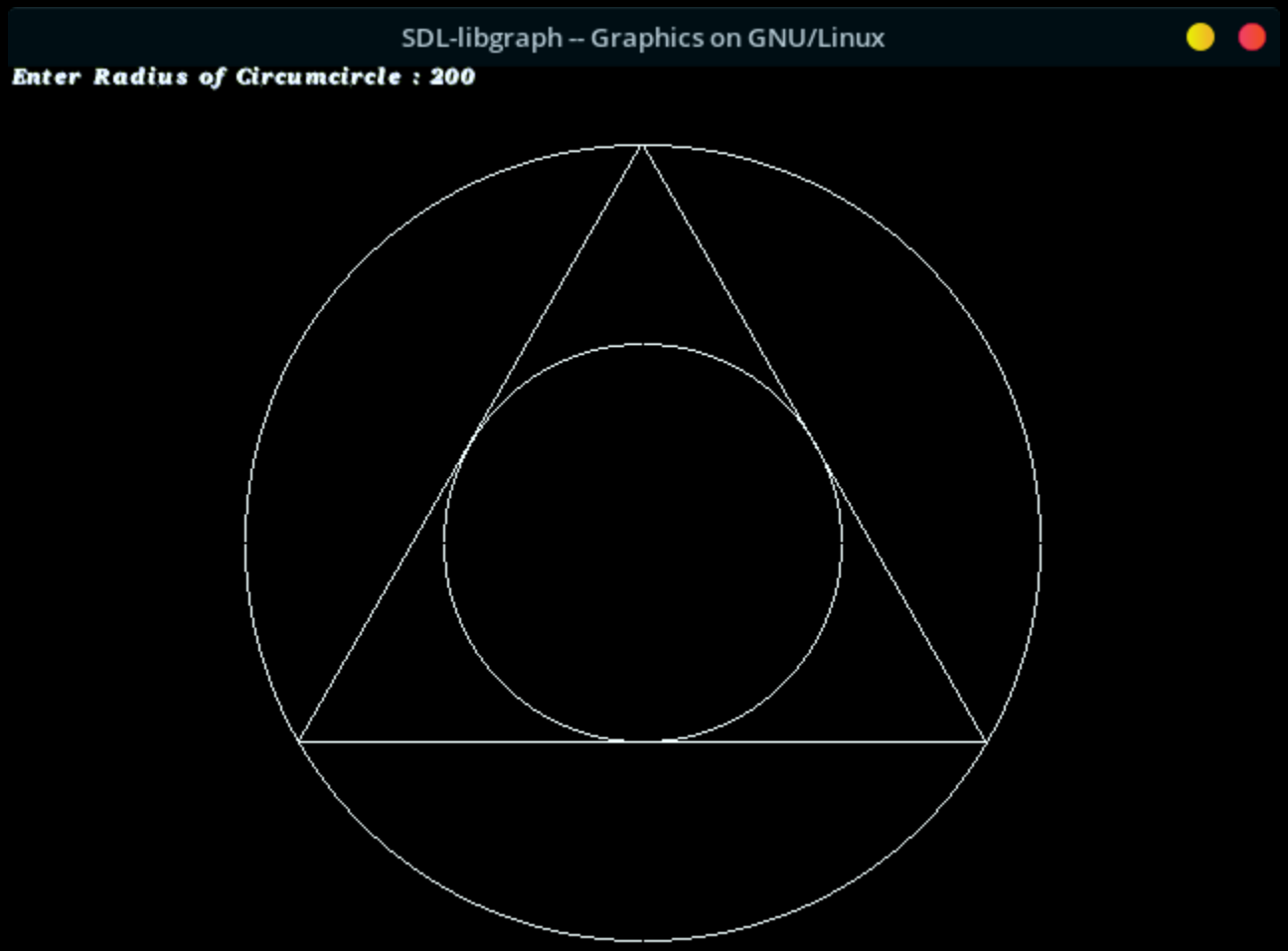
8). Draw a circle with coordinates of center (xr,yr) and radius r1 and r2.

Program:

```
#include <stdio.h>
#include <math.h>
#include <graphics.h>
using namespace std;

#define PI 3.141592654

void drawLine(int x1, int y1, int x2, int y2) {
    int dx = x2 - x1, dy = y2 - y1, steps = abs(dx) > abs(dy) ? abs(dx) + 1 :
abs(dy) + 1;
    float Xinc = dx / (float) steps, Yinc = dy / (float) steps;
    for (float x = x1, y = y1; steps--; x += Xinc, y += Yinc)
        putpixel(x, y, WHITE);
}

void display(int x1, int y1, int x, int y) {
    putpixel(x1 + x, y1 + y, WHITE);
    putpixel(x1 + x, y - y1, WHITE);
    putpixel(x - x1, y1 + y, WHITE);
    putpixel(x - x1, y - y1, WHITE);
    putpixel(x + y1, y + x1, WHITE);
    putpixel(x + y1, y - x1, WHITE);
    putpixel(x - y1, y + x1, WHITE);
    putpixel(x - y1, y - x1, WHITE);
}

void drawCircle(int x, int y, int r) {
    int x1 = 0;
    int y1 = r;
    int dp = 3 - 2 * r;
    while (x1 <= y1) {
        if (dp <= 0)
            dp += (4 * x1) + 6;
        else
            dp += 4 * (x1 - y1--) + 10;
        display(++x1, y1, x, y);
    }
}

void drawPattern(int R) {
    int Ox = getmaxx() / 2;
    int Oy = getmaxy() / 2;
    int s = 2 * R * cos(PI / 6);
    int x1 = Ox, y1 = Oy - R, x2 = Ox - (s / 2), x3 = Ox + (s / 2), y2 = Oy + R /
2, y3 = y2;
    drawLine(x1, y1, x2, y2);
    drawLine(x1, y1, x3, y3);
```

```
    drawLine(x2, y2, x3, y3);
    drawCircle(Ox, Oy, R);
    drawCircle(Ox, Oy, R / 2);
}

int main(void) {
    int gd = DETECT, gm;
    initgraph( & gd, & gm, NULL);
    int R;
    printf("Enter Radius of Circumcircle : ");
    scanf("%d", & R);
    drawPattern(R);
    getch();
    closegraph();
    return 0;
}
```

Output :


SDL-libgraph -- Graphics on GNU/Linux
Enter Radius of Circumcircle : 200