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Experiment 10

Aim: Implement koch curve for fractal generation.

Theory: The curve is a type of fractal curve in which the next iteration of the curve is formed by adding an outward bend to each line segment in the previous iteration.

Algorithm:

```
drawKoch(x1, y1, x2, y2, n):
    if n is 0:
        drawLine(x1, y1, x2, y2)
    else:
        calculate x3, y3, x4, y4, θ, L, x5, y5 as
        x3 = (1*x2 + 2*x1)/3 , y3 = (1*y2 + 2*y1)/3
        x4 = (2*x2 + 1*x1)/3 , y4 = (2*y2 + 1*y1)/3
        θ = tan^-1((y2 - y1)/(x2 - x1))
        L = sqrt((x2 - x1)^2 + (y2 - y1)^2)
        x5 = x3 + (1/3) L cos(θ + π/3)

        y5 = y3 + (1/3) L sin(θ + π/3)

        drawKoch(x1, y1, x3, y3, n-1)
        drawKoch(x3, y3, x5, y5, n-1)
        drawKoch(x5, y5, x4, y4, n-1)
        drawKoch(x4, y4, x2, y2, n-1)
```

Take number of iterations (n) as input from the user and call drawKoch(100, 200, 300, 200, n).

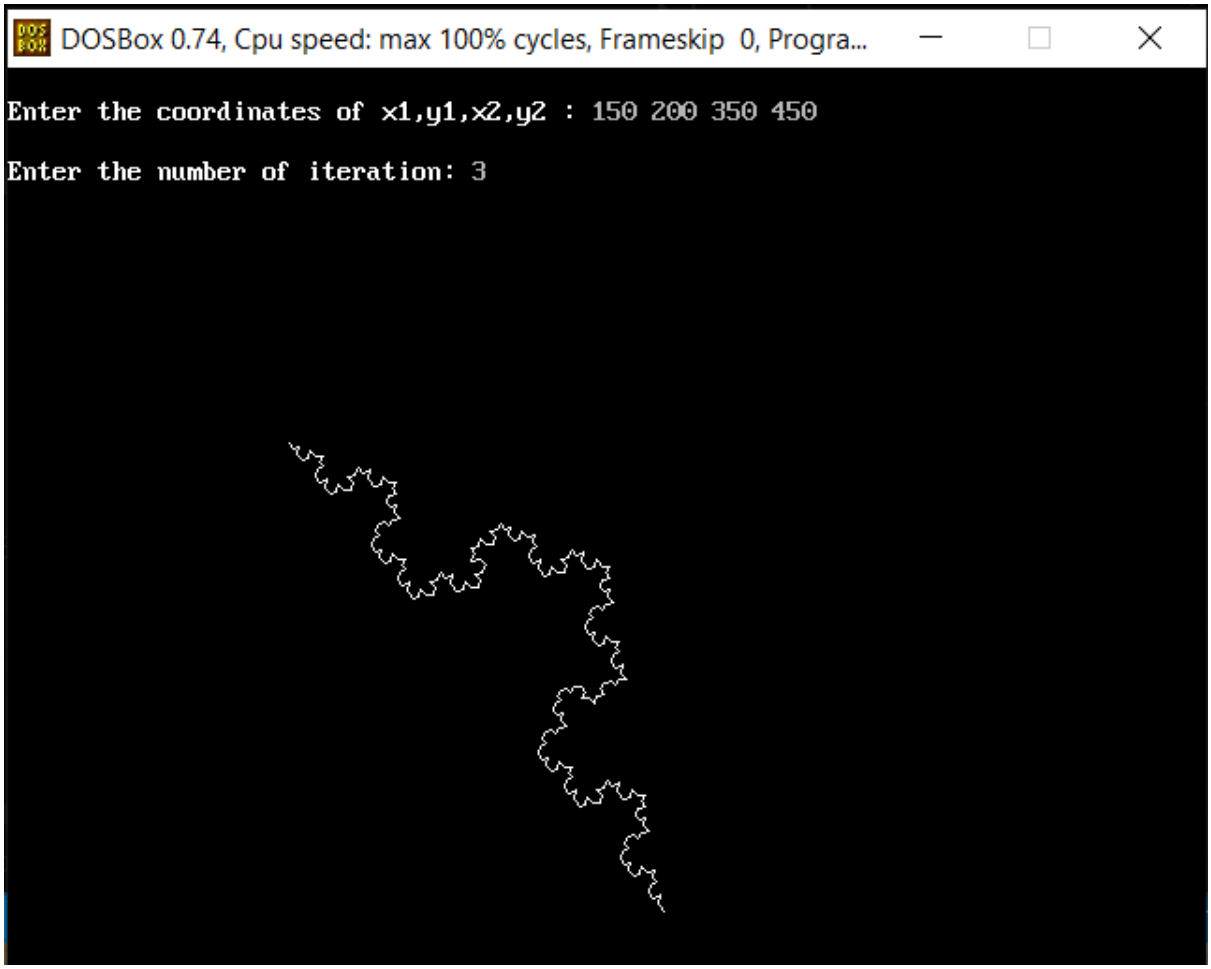
PROGRAM:

Code:

```
#include<graphics.h>
#include<conio.h>
#include<math.h>
void koch(int x1, int y1, int x2, int y2, int iteration)
{
 float angle = 60*M_PI/180;
 int x3 = (2*x1+x2)/3;
 int y3 = (2*y1+y2)/3;
 int x4 = (x1+2*x2)/3;
 int y4 = (y1+2*y2)/3;
 int x = x3 + (x4-x3)*cos(angle)+(y4-y3)*sin(angle);
 int y = y3 - (x4-x3)*sin(angle)+(y4-y3)*cos(angle);
 if(iteration > 0)
 {
 koch(x1, y1, x3, y3, iteration-1);
 koch(x3, y3, x, y, iteration-1);
 koch(x, y, x4, y4, iteration-1);
 koch(x4, y4, x2, y2, iteration-1);
 }
 else
 {
 line(x1, y1, x3, y3);
 line(x3, y3, x, y);
 line(x, y, x4, y4);
 line(x4, y4, x2, y2);
```

```
 }
}
int main(void)
{
 int gd = DETECT, gm;
 int x1, y1 , x2, y2, n;
 initgraph(&gd, &gm, "C:\\TURBOC3\\BGI");
 printf("\nEnter the coordinates of x1,y1,x2,y2 : ");
 scanf("%d%d%d%d",&x1,&y1,&x2,&y2 );
 printf("\nEnter the number of iteration: ");
 scanf("%d",&n);
 koch(x1, y1, x2, y2, n);
 getch();
 return 0;
}
```

OUTPUT:


DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Progra...
Enter the coordinates of x1,y1,x2,y2 : 150 200 350 450
Enter the number of iteration: 3