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Class: SY IT A1

Assignment 5

Aim: 2D transformations

Implementation:

```cpp
#include<iostream>
#include<graphics.h>
#include<cmath>
using namespace std;

int midx,midy,n;

void drawaxis()
{
    int xmax,ymax;
    xmax=getmaxx();
    ymax=getmaxy();
    midx=xmax/2;
    midy=ymax/2;
    line(0,midy,xmax,midy);
    line(midx,0,midx,ymax);
    }

    void drawpoly(int x[],int y[])
    {
      for(int i=0;i<n-1;i++){
        line(x[i]+midx,midy-y[i],x[i+1]+midx,midy-y[i+1]);
      }
        line(x[0]+midx,midy-y[0],x[n-1]+midx,midy-y[n-1]);
      }

    void trans(int x[],int y[],int tx,int ty)
    {
       int x1[5], y1[5],i;
       for(int i=0;i<n;i++){
          x1[i]=x[i]+tx;
          y1[i]=y[i]+ty;
       }

       drawaxis();
       drawpoly(x1,y1);
       getch();
```

```cpp
    }
    void scale(int x[],int y[],float sx,float sy)
{
  int x1[5],y1[5],i;
   for(i=0;i<n;i++)
{
   x1[i]=x[i]*sx;
  y1[i]=y[i]*sy;
}

  drawaxis();
  drawpoly(x1,y1);
  getch();
}

void rotate(int x[],int y[],int ang)
{
    int x1[5],y1[5],i;
    for(i=0;i<4;i++)
    {
        x1[i]=((x[i]*cos(ang*3.142/180))-(y[i]*sin(ang*3.142/180)));
        y1[i]=((x[i]*sin(ang*3.142/180))+(y[i]*cos(ang*3.142/180)));
    }
    drawaxis();
    drawpoly(x1,y1);

    getch();
}

void reflection(int x[],int y[])
{
    int x1[5],y1[5],i;
    int axis;
    cout<<"\n reflection about x-axis\n";
    cout<<"\nabout: \n";
    cin>>axis;
    if(axis==1){
    for(i=0;i<n;i++)
    {
        x1[i]=x[i];
        y1[i]=y[i]*(-1);
    }
    drawaxis();
    drawpoly(x1,y1);
    getch();
    }
    else{
    cout<<"\n reflection about y=-x\n";
```

```cpp
    for(i=0;i<n;i++)
    {
        x1[i]=-x[i];
        y1[i]=y[i];
    }
    drawaxis();

    drawpoly(x1,y1);
    getch();
    }
}

int main(void){
    int gd = DETECT, gm;
    int x[5],y[5],i,ch;

     initgraph(&gd, &gm,NULL);
     drawaxis();
     cout<<"\nEnter the number of vertices: \t";
     cin>>n;
     cout<<"\nEnter the coordinates: \t\n";
     for(int i=0;i<n;i++){
      cout<<"x"<<i+1<<":";
      cin>>x[i];
      cout<<"y"<<i+1<<":";
      cin>>y[i];
      }

     drawpoly(x,y);

     while(1)
     {
      cleardevice();
      cout<<"\n1.Translate\n2.Scale\n3.Rotate\n4.Reflection\n5.exit\nEnter
your choice:";
      cin>>ch;

      switch(ch)
      {
        case 1:
         cleardevice();
         drawaxis();
         drawpoly(x,y);
         cout<<"\nEnter tx,ty:\t";
         int tx,ty;
         cin>>tx>>ty;
         trans(x,y,tx,ty);
         getch();
```

```cpp
                break;

        case 2:

                cleardevice();
                drawaxis();
                drawpoly(x,y);
                cout<<"\nEnter sx,sy:\t";
                float sx,sy;
                cin>>sx>>sy;
                scale(x,y,sx,sy);
                getch();
                break;

        case 3:

                cleardevice();
        drawaxis();
        drawpoly(x,y);
        cout<<"\n Enter angle of rotation\t";
        int ang;
        cin>>ang;
        rotate(x,y,ang);
        getch();
        break;

        case 4:{


        cleardevice();
           //    drawaxis();
        drawpoly(x,y);
        cout<<"\n reflection\t";
        reflection(x,y);
        getch();
                break;



                default:exit(0);
          }
        }

        closegraph();
        getch();
        return 0;
    }
}
```
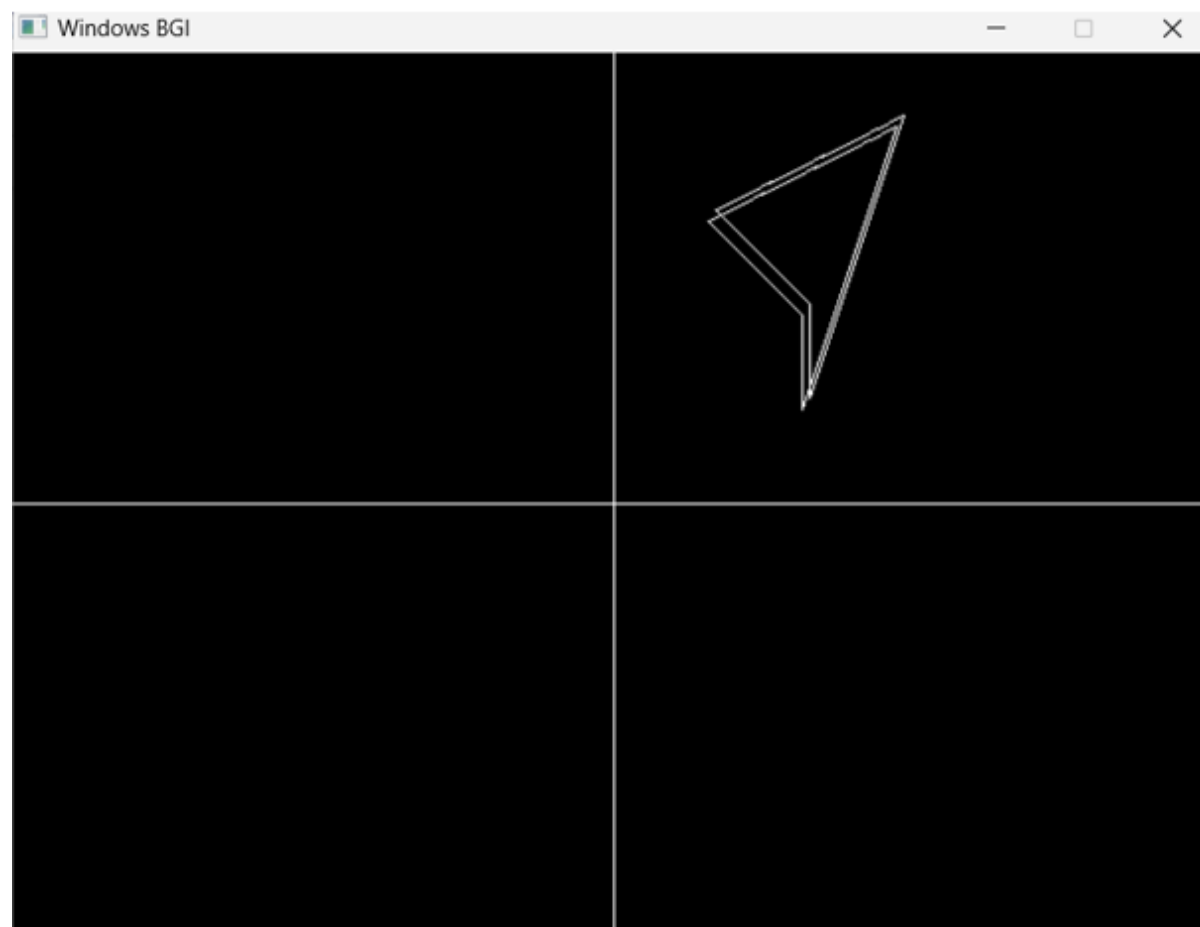
Output:

1.Translation:

```
Enter the number of vertices:    4

Enter the coordinates:
x1:100
y1:100
x2:50
y2:150
x3:150
y3:200
x4:100
y4:50

1.Translate
2.Scale
3.Rotate
4.Reflection
5.exit
Enter your choice:1

Enter tx,ty:    4 6
```

2.Scale:


```
Enter the number of vertices:   4

Enter the coordinates:
x1:100
y1:100
x2:50
y2:150
x3:150
y3:200
x4:100
y4:50

1.Translate
2.Scale
3.Rotate
4.Reflection
5.exit
Enter your choice:2

Enter sx,sy:     7 8
```
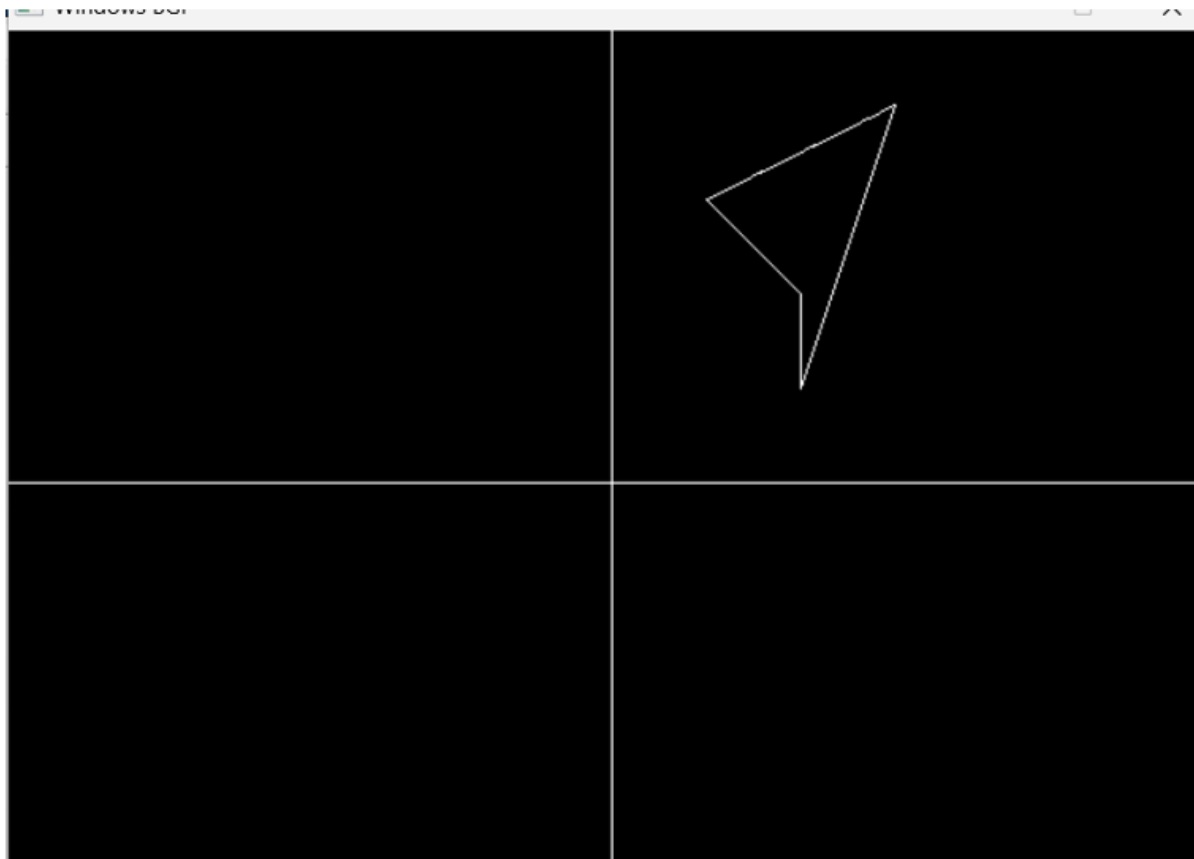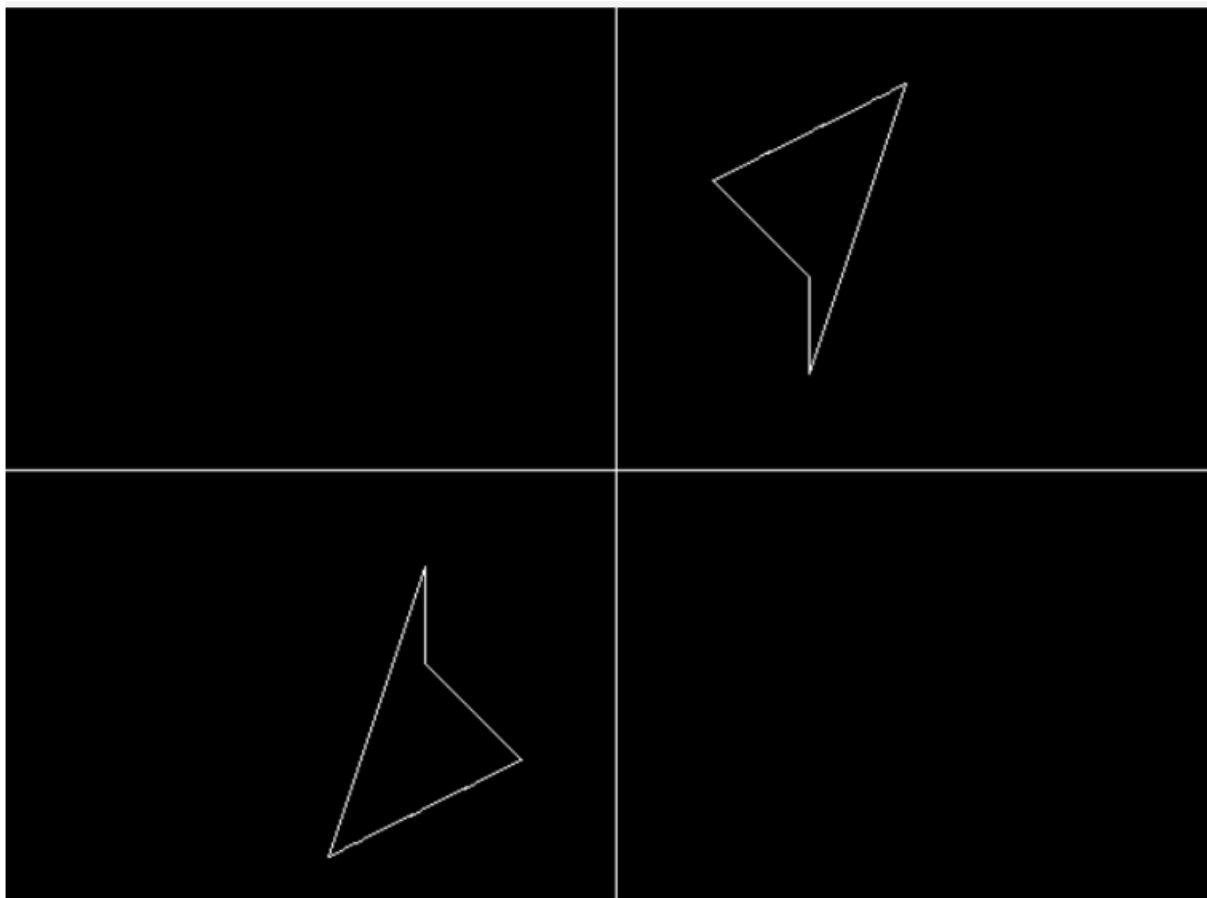
3.Rotation:

```
Enter the number of vertices:   4

Enter the coordinates:
x1:100
y1:100
x2:50
y2:150
x3:150
y3:200
x4:100
y4:50

1.Translate
2.Scale
3.Rotate
4.Reflection
5.exit
Enter your choice:3

 Enter angle of rotation        180
```
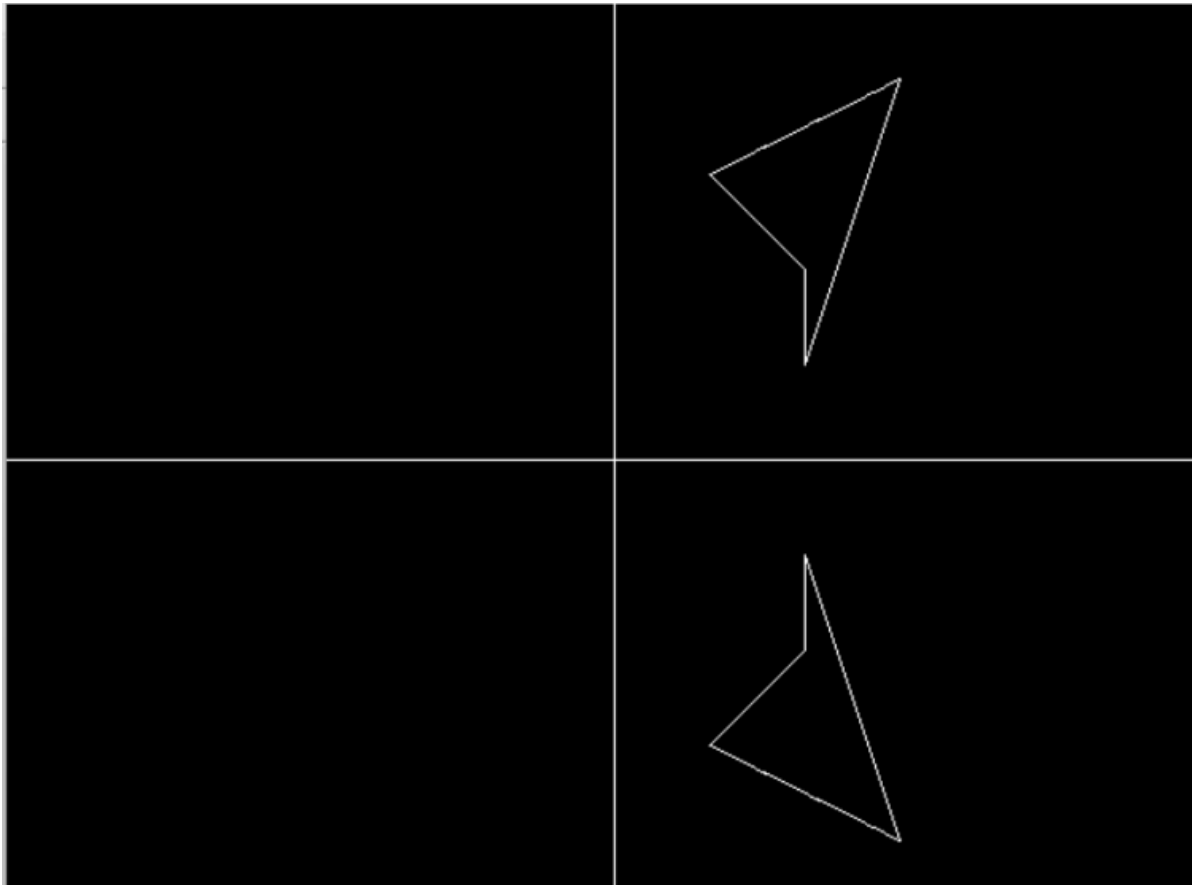
4.Reflection:

- About x axis:


```
Enter the number of vertices:    4

Enter the coordinates:
x1:100
y1:100
x2:50
y2:150
x3:150
y3:200
x4:100
y4:50

1.Translate
2.Scale
3.Rotate
4.Reflection
5.exit
Enter your choice:4

 reflection
 reflection about x-axis

about:
1
```

- About y-axis:


```
Enter the number of vertices:    4

Enter the coordinates:
x1:100
y1:100
x2:50
y2:150
x3:150
y3:200
x4:100
y4:50

1.Translate
2.Scale
3.Rotate
4.Reflection
5.exit
Enter your choice:4

 reflection
 reflection about x-axis

about:
2

 reflection about y=-x
```