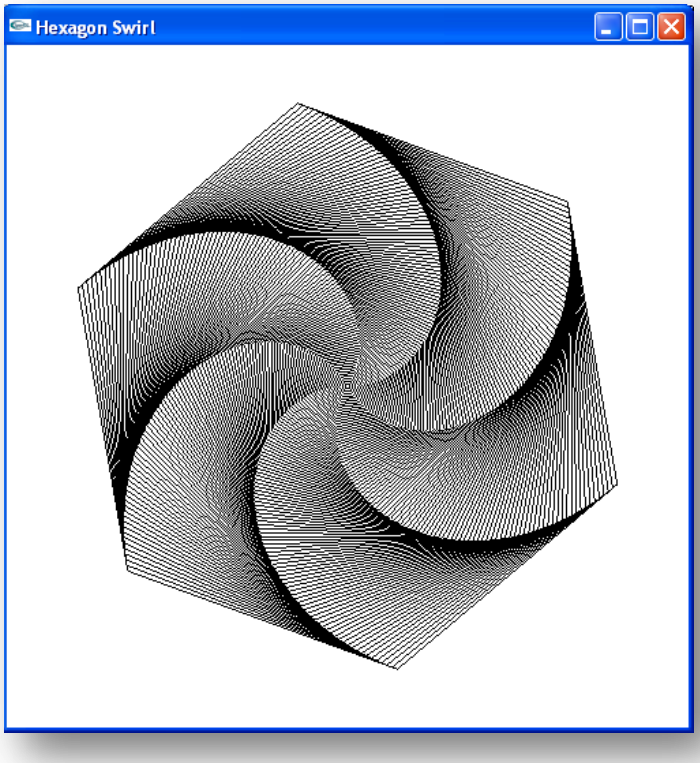
CSC 305 **Computer Graphics**

Lab Exercise

Zooming in on the Swirl of hexagons, using keyboard interaction.

Sample Output



Source Code

```
#include <cstdlib>
#include <GL/glut.h>
#include <cmath>
using namespace std;

//set the width and height of the screen window
int screenWidth = 500;
int screenHeight = 500;

//--------------- setWindow ---------------------
void setWindow(double left, double right, double bottom, double top)
{
      glMatrixMode(GL_PROJECTION);
      glLoadIdentity();
      gluOrtho2D(left, right, bottom, top);
}
//---------------- setViewport ------------------
void setViewport(double left, double right, double bottom, double top)
{
      glViewport(left, bottom, right-left, top-bottom);
}

////////////////////////////////////////////////////////////////
// Function:  myinit()
// This function handles all initialization of OpenGL.
////////////////////////////////////////////////////////////////
void myinit()
{
      glClearColor (1.0, 1.0, 1.0, 0.0);        //set the background color to whait
      glColor3f (0.0, 0.0, 0.0);                //set the foreground color to black
      glPointSize (3.0);                        //set the point size to 3 X 3 pixels
    setViewport (0.0, 0.0, 500.0, 500.0); //set the viewport to be the entire window

      //set up a world window to screen transformation
      setWindow(-6.0, 6.0, -6.0, 6.0);

      glMatrixMode (GL_MODELVIEW);
}

////////////////////////////////////////////////////////////////
// Function: hexswirl()
// This draws a hexagon on the screen many times.  Each new hexagon is slightly
// bigger than the previous one and rotated slightly so that a hexagon "swirl" is
// drawn.
////////////////////////////////////////////////////////////////
void hexswirl()
{
      double angle;                       //the angle of rotation
      double angleInc = 2*3.14159265/6.0; //the angle increment
      double inc = 5.0/100;               //the radius increment
      double radius = 5.0/100.0;          //the radius to be used

      //clear the background
      glClear (GL_COLOR_BUFFER_BIT);

      //draw the hexagon swirl
      for (int j = 0; j <= 100; j++)
      {
```

```
            //the angle of rotation depends on which hexagon is being drawn.
            angle = j* (3.14159265/180.0);

            //draw one hexagon
            glBegin (GL_LINE_STRIP);
                  for (int k=0; k <= 6; k++)
                  {
                        angle += angleInc;
                        glVertex2d(radius * cos(angle), radius *sin(angle));
                  }
            glEnd();

            //determine the radius of the next hexagon
            radius += inc;
      }
      //swap buffers for a smooth change from one frame to another
      glutSwapBuffers();

      glFlush();
}

////////////////////////////////////////////////////////////////
// Function: zoomIn()
// This function draws several frames.  Each frame draws the
// same hexagon swirl but before drawing it, the world
// window is changed so that a new portion of the swirl
// is viewed.
////////////////////////////////////////////////////////////////
void zoomIn(unsigned char key, int x, int y)
{
      float cx = 0.1, cy = 0.1;       //each world window is centered about (cx, cy)
      float h=1.2, w = 1.2;           //the width and height of the window
      float aspect=0.7;
      int NumFrames = 5;             //the number of frames in the animation
    setViewport (10.0, 200.0, 10.0, 200.0);

      //this loop controls the animation, drawing a hexagon swirl
      //on each successive frame.
      for (int frame = 0; frame < NumFrames; frame++)
      {
            //change the width and height of the window each time
            w *= 0.9;
            h *= w / aspect;

            //change the window and draw the hexagon swirl
            setWindow(cx - w, cx + w, cy - h, cy + h);
            hexswirl();

            //the lazy man's time delay
            for (int i = 0; i <= 200000000; i++);
      }
}



void myDisplay(void)
{
      //clear the background
      glClear (GL_COLOR_BUFFER_BIT);
      hexswirl();
}
```

```
int main(int argc, char** argv)
{
	//initialize the OpenGL Utility Toolkit
	glutInit(&argc, argv);

	//set the display mode--a double display buffer and colors
	//specified using amounts of red, green, & blue
	glutInitDisplayMode( GLUT_DOUBLE | GLUT_RGB);

	//request a screen window 500 pixels wide by 500 pixels high
	glutInitWindowSize(screenWidth, screenHeight);

	//specify the window position
	glutInitWindowPosition(0,0);

	//open and display the window putting "Hexagon Swirl" on
	//the title bar
	glutCreateWindow("Hexagon Swirl");

	//register the hexswirl() function as the function to
	//activate when a redraw event occurs.
	glutDisplayFunc(/*hexswirl*/ myDisplay);

	//register the zoomIn() function as the function to
	//activate when any key on the keyboard is pressed.
	glutKeyboardFunc(zoomIn);

	//set up the initial state of some of OpenGL's variables
	myinit();

	//enter an unending loop waiting from events to occur
	glutMainLoop();
	return 0;
}
```