

НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ

«ХАРКІВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ»

Кафедра «ОБЧИСЛЮВАЛЬНОЇ ТЕХНІКИ ТА ПРОГРАМУВАННЯ»

«Комп'ютерна графіка»

Звіт з лабораторної роботи №9

Тема: «ПЕРЕТВОРЕННЯ НА ПЛОЩИНІ»

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## Лабораторна робота №9

### ПЕРЕТВОРЕННЯ НА ПЛОЩИНІ

**Ціль:** вивчити, як виконуються двомірні перетворення за допомогою однорідних координат і матриці перетворення  $3 \times 3$ . Написати і налагодити програму для 2D перетворень.

**Індивідуальне завдання:** Виконати види афінних перетворення фігури за індивідуальним варіантом. При виконанні завдання передбачити відновлення початкової позиції фігури. Керування організувати як через інтерфейсні елементи (меню, кнопки, рядки редагування і ін.), так і через «гарячі» клавіші.

#### Результати роботи

##### Код програми

##### Файл Form1.cs

```
using System;
using System.Drawing;
using System.Windows.Forms;
using System.Drawing.Drawing2D;

namespace lab09
{
    public partial class Form1 : Form
    {
        private int x = 0, y = -47; //начальные координаты фигуры
        public Form1()
        {
            InitializeComponent();
            this.BackColor = Color.White;
            this.KeyPreview = true;
```

```

this.Text = "Lab 9. Momot Roman";

panel1.Paint += new PaintEventHandler(panel1Paint);
}
private void panel1Paint(object sender, PaintEventArgs e)
{
    Graphics g = e.Graphics;
    DrawAxis(g);
    ApplyTransformation(g);
}
private void ApplyTransformation(Graphics g)
{
    Matrix m = new Matrix(); // Новая матрица преобразования
    m.Translate(panel1.Width / 2, panel1.Height / 2); // Определяем центр

    // Перемещение
    int dx = Convert.ToInt16(tbTranslationX.Text);
    int dy = -Convert.ToInt16(tbTranslationY.Text);
    m.Translate(dx, dy);

    // Масштабирование
    float sx = Convert.ToSingle(tbScaleX.Text);
    m.Scale(sx, sx);

    // Поворот
    float angle = Convert.ToSingle(tbRotationAngle.Text);
    m.RotateAt(angle, new PointF(0, 0));

    // Сдвиг
    float alpha = Convert.ToSingle(tbShearX.Text);
    float beta = Convert.ToSingle(tbShearY.Text);
    m.Shear(alpha, beta);

```

```

        g.Transform = m;
        DrawFigure(g, Color.Black);
    }
    private void DrawFigure(Graphics g, Color color)
    {
        SolidBrush brush = new SolidBrush(color);
        Point[] curvePoints = {
            new Point(x, y),
            new Point(x + 12, y + 37),
            new Point(x + 52, y + 37),
            new Point(x + 21, y + 59),
            new Point(x + 32, y + 95),
            new Point(x + 0, y + 75),
            new Point(x - 32, y + 95),
            new Point(x - 21, y + 59),
            new Point(x - 51, y + 37),
            new Point(x - 11, y + 37)
        };

        g.FillPolygon(brush, curvePoints);
    }
    private void DrawAxis(Graphics g)
    {
        Matrix m = new Matrix();

        // определяем матрицу преобразований
        m.Translate(panel1.Width / 2, panel1.Height / 2);

        // Применяем матрицу преобразования к графическому объекту:
        g.Transform = m;

        // Рисуем оси x и y:
        g.DrawLine(Pens.Blue, -panel1.Width / 2, 0, panel1.Width / 2, 0);
    }

```

```

g.DrawLine(Pens.Blue, 0, -panel1.Height / 2, 0, panel1.Height / 2);

// Добавляем метки к осям X и Y:
g.DrawString("X", this.Font, Brushes.Blue, panel1.Width / 2 - 20, -20);
g.DrawString("Y", this.Font, Brushes.Blue, 5, -panel1.Height / 2 + 5);
}

private void button1_Click_1(object sender, EventArgs e)
{
    panel1.Invalidate();
}

private void button2_Click(object sender, EventArgs e)
{
    //Сбрасываем параметры к исходным
    tbTranslationX.Text = "0";
    tbTranslationY.Text = "0";
    tbScaleX.Text = "1";
    tbRotaionAngle.Text = "0";
    tbShearX.Text = "0";
    tbShearY.Text = "0";

    panelbm.Invalidate();
    panel1.Invalidate();
}

private void button1_KeyDown(object sender, KeyEventArgs e)
{
    {
        button1.PerformClick();// имитируем нажатие button1
    }
}

private void Form1_KeyDown(object sender, KeyEventArgs e)
{
    if (e.KeyValue == (char)Keys.Right)

```

```

{
    Matrix m = new Matrix();
    m.Translate(panel1.Width / 2, panel1.Height / 2);

    int dx = Convert.ToInt16(tbTranslationX.Text) + 1;
    tbTranslationX.Text = dx.ToString();

    int dy = -Convert.ToInt16(tbTranslationY.Text);
    m.Translate(dx, dy);

    panel1.Invalidate();
}

if (e.KeyValue == (char)Keys.Left)
{
    Matrix m = new Matrix();
    m.Translate(panel1.Width / 2, panel1.Height / 2);

    int dx = Convert.ToInt16(tbTranslationX.Text) - 1;
    tbTranslationX.Text = dx.ToString();

    int dy = -Convert.ToInt16(tbTranslationY.Text);

    m.Translate(dx, dy);
    panel1.Invalidate();
}

if (e.KeyValue == (char)Keys.Up)
{
    Matrix m = new Matrix();
    m.Translate(panel1.Width / 2, panel1.Height / 2);

    int dx = Convert.ToInt16(tbTranslationX.Text);
    int dy = Convert.ToInt16(tbTranslationY.Text) + 1;
    tbTranslationY.Text = dy.ToString();
}

```

```

        m.Translate(dx, dy);
        panel1.Invalidate();
    }
    if (e.KeyValue == (char)Keys.Down)
    {
        Matrix m = new Matrix();
        m.Translate(panel1.Width / 2, panel1.Height / 2);

        int dx = Convert.ToInt16(tbTranslationX.Text);
        int dy = Convert.ToInt16(tbTranslationY.Text) - 1;
        tbTranslationY.Text = dy.ToString();

        m.Translate(dx, dy);
        panel1.Invalidate();
    }
    if (e.KeyValue == (char)Keys.Up && e.KeyValue == (char)Keys.Left)
    {
        Matrix m = new Matrix();
        m.Translate(panel1.Width / 2, panel1.Height / 2);

        int dx = Convert.ToInt16(tbTranslationX.Text) - 1;
        tbTranslationX.Text = dx.ToString();

        int dy = Convert.ToInt16(tbTranslationY.Text) + 1;
        tbTranslationY.Text = dy.ToString();

        m.Translate(dx, dy);
        panel1.Invalidate();
    }
    if (e.KeyValue == (char)Keys.Up && e.KeyValue == (char)Keys.Right)
    {
        Matrix m = new Matrix();

```

```

m.Translate(panel1.Width / 2, panel1.Height / 2);

int dx = Convert.ToInt16(tbTranslationX.Text) + 1;
tbTranslationX.Text = dx.ToString();

int dy = Convert.ToInt16(tbTranslationY.Text) + 1;
tbTranslationY.Text = dy.ToString();

m.Translate(dx, dy);
panel1.Invalidate();
}
if (e.KeyValue == (char)Keys.Down && e.KeyValue == (char)Keys.Right)
{
    Matrix m = new Matrix();
    m.Translate(panel1.Width / 2, panel1.Height / 2);

    int dx = Convert.ToInt16(tbTranslationX.Text) + 1;
    tbTranslationX.Text = dx.ToString();

    int dy = Convert.ToInt16(tbTranslationY.Text) - 1;
    tbTranslationY.Text = dy.ToString();

    m.Translate(dx, dy);
    panel1.Invalidate();
}
if (e.KeyValue == (char)Keys.Down && e.KeyValue == (char)Keys.Left)
{
    Matrix m = new Matrix();
    m.Translate(panel1.Width / 2, panel1.Height / 2);

    int dx = Convert.ToInt16(tbTranslationX.Text) - 1;
    tbTranslationX.Text = dx.ToString();

```



```

int dy = Convert.ToInt16(tbTranslationY.Text) - 1;
tbTranslationY.Text = dy.ToString();

m.Translate(dx, dy);
panel1.Invalidate();
}
if (e.KeyValue == (char)Keys.Q)
{
    Matrix m = new Matrix();
    m.Translate(panel1.Width / 2, panel1.Height / 2);

    float angle = Convert.ToSingle(tbRotaionAngle.Text) - 1;
    tbRotaionAngle.Text = angle.ToString();

    m.RotateAt(angle, new PointF(0, 0));
}
if (e.KeyValue == (char)Keys.E)
{
    Matrix m = new Matrix();
    m.Translate(panel1.Width / 2, panel1.Height / 2);

    float angle = Convert.ToSingle(tbRotaionAngle.Text) + 1;
    tbRotaionAngle.Text = angle.ToString();

    m.RotateAt(angle, new PointF(0, 0));
}
}
private void button2_KeyDown(object sender, KeyEventArgs e)
{
    {
        button2.PerformClick();// имитируем нажатие button2
    }
}

```

```

private void тЫКToolStripMenuItem_Click(object sender, EventArgs e)
{
    string message = "Q, E - Наклон фигуры\nСтрелки - Перемещение
фигуры";
    string title = "Помощь";
    MessageBox.Show(message, title);
}

private void label3_Click(object sender, EventArgs e) { }
private void textBox1_TextChanged(object sender, EventArgs e) { }
private void textBox2_TextChanged(object sender, EventArgs e) { }
private void tbScaleX_TextChanged(object sender, EventArgs e) { }
}
}

```

#### Файл Form1.Designer.cs

```

namespace lab09
{
    partial class Form1
    {
        /// <summary>
        /// Обязательная переменная конструктора.
        /// </summary>
        private System.ComponentModel.IContainer components = null;

        /// <summary>
        /// Освободить все используемые ресурсы.
        /// </summary>
        /// <param name="disposing">истинно, если управляемый ресурс должен
        быть удален; иначе ложно.</param>
        protected override void Dispose(bool disposing)
        {
            if (disposing && (components != null))

```

```
{
    components.Dispose();
}
base.Dispose(disposing);
}
```

#region Код, автоматически созданный конструктором форм Windows

```
/// <summary>
```

```
/// Требуемый метод для поддержки конструктора — не изменяйте
```

```
/// содержимое этого метода с помощью редактора кода.
```

```
/// </summary>
```

```
private void InitializeComponent()
```

```
{
```

```
    System.ComponentModel.ComponentResourceManager resources = new
System.ComponentModel.ComponentResourceManager(typeof(Form1));
```

```
    this.panel1 = new System.Windows.Forms.Panel();
```

```
    this.button2 = new System.Windows.Forms.Button();
```

```
    this.button1 = new System.Windows.Forms.Button();
```

```
    this.label9 = new System.Windows.Forms.Label();
```

```
    this.label8 = new System.Windows.Forms.Label();
```

```
    this.label5 = new System.Windows.Forms.Label();
```

```
    this.label2 = new System.Windows.Forms.Label();
```

```
    this.label1 = new System.Windows.Forms.Label();
```

```
    this.tbShearY = new System.Windows.Forms.TextBox();
```

```
    this.panelbm = new System.Windows.Forms.Panel();
```

```
    this.tbTranslationY = new System.Windows.Forms.TextBox();
```

```
    this.tbTranslationX = new System.Windows.Forms.TextBox();
```

```
    this.textBox4 = new System.Windows.Forms.TextBox();
```

```
    this.textBox3 = new System.Windows.Forms.TextBox();
```

```
    this.textBox2 = new System.Windows.Forms.TextBox();
```

```
    this.textBox1 = new System.Windows.Forms.TextBox();
```

```
    this.tbShearX = new System.Windows.Forms.TextBox();
```

```

this.tbRotaionAngle = new System.Windows.Forms.TextBox();
this.tbScaleX = new System.Windows.Forms.TextBox();
this.label3 = new System.Windows.Forms.Label();
this.menuStrip1 = new System.Windows.Forms.MenuStrip();
this.помощьToolStripMenuItem = new
System.Windows.Forms.ToolStripItem();
this.тЫКToolStripMenuItem = new
System.Windows.Forms.ToolStripItem();
this.panelbm.SuspendLayout();
this.menuStrip1.SuspendLayout();
this.SuspendLayout();
//
// panel1
//
this.panel1.BorderStyle = System.Windows.Forms.BorderStyle.FixedSingle;
this.panel1.Location = new System.Drawing.Point(147, 41);
this.panel1.Name = "panel1";
this.panel1.Size = new System.Drawing.Size(444, 483);
this.panel1.TabIndex = 24;
//
// button2
//
this.button2.Location = new System.Drawing.Point(19, 338);
this.button2.Name = "button2";
this.button2.Size = new System.Drawing.Size(100, 23);
this.button2.TabIndex = 23;
this.button2.Text = "Сброс";
this.button2.UseVisualStyleBackColor = true;
this.button2.Click += new System.EventHandler(this.button2_Click);
this.button2.KeyDown += new
System.Windows.Forms.KeyEventHandler(this.button2_KeyDown);
//
// button1

```

```

//
this.button1.Cursor = System.Windows.Forms.Cursors.Hand;
this.button1.Location = new System.Drawing.Point(19, 309);
this.button1.Name = "button1";
this.button1.Size = new System.Drawing.Size(100, 23);
this.button1.TabIndex = 22;
this.button1.Text = "Результат";
this.button1.UseVisualStyleBackColor = true;
this.button1.Click += new System.EventHandler(this.button1_Click_1);
this.button1.KeyDown += new
System.Windows.Forms.KeyEventHandler(this.button1_KeyDown);
//
// label9
//
this.label9.AutoSize = true;
this.label9.Font = new System.Drawing.Font("Microsoft Sans Serif", 11.25F,
System.Drawing.FontStyle.Regular, System.Drawing.GraphicsUnit.Point,
((byte)(204)));
this.label9.Location = new System.Drawing.Point(27, 267);
this.label9.Name = "label9";
this.label9.Size = new System.Drawing.Size(17, 18);
this.label9.TabIndex = 21;
this.label9.Text = "Y";
//
// label8
//
this.label8.AutoSize = true;
this.label8.Font = new System.Drawing.Font("Microsoft Sans Serif", 11.25F,
System.Drawing.FontStyle.Regular, System.Drawing.GraphicsUnit.Point,
((byte)(204)));
this.label8.Location = new System.Drawing.Point(26, 241);
this.label8.Name = "label8";
this.label8.Size = new System.Drawing.Size(18, 18);

```

```

this.label8.TabIndex = 20;
this.label8.Text = "X";
//
// label5
//
this.label5.AutoSize = true;
this.label5.Font = new System.Drawing.Font("Microsoft Sans Serif", 11.25F);
this.label5.Location = new System.Drawing.Point(16, 180);
this.label5.Name = "label5";
this.label5.Size = new System.Drawing.Size(42, 18);
this.label5.TabIndex = 17;
this.label5.Text = "УГОЛ";
//
// label2
//
this.label2.AutoSize = true;
this.label2.Font = new System.Drawing.Font("Microsoft Sans Serif", 11.25F,
System.Drawing.FontStyle.Regular, System.Drawing.GraphicsUnit.Point,
((byte)(204)));
this.label2.Location = new System.Drawing.Point(26, 57);
this.label2.Name = "label2";
this.label2.Size = new System.Drawing.Size(17, 18);
this.label2.TabIndex = 14;
this.label2.Text = "Y";
//
// label1
//
this.label1.AutoSize = true;
this.label1.Font = new System.Drawing.Font("Microsoft Sans Serif", 11.25F,
System.Drawing.FontStyle.Regular, System.Drawing.GraphicsUnit.Point,
((byte)(204)));
this.label1.Location = new System.Drawing.Point(25, 34);
this.label1.Name = "label1";

```

```
this.label1.Size = new System.Drawing.Size(18, 18);
this.label1.TabIndex = 13;
this.label1.Text = "X";
//
// tbShearY
//
this.tbShearY.Location = new System.Drawing.Point(78, 267);
this.tbShearY.Name = "tbShearY";
this.tbShearY.Size = new System.Drawing.Size(50, 20);
this.tbShearY.TabIndex = 12;
this.tbShearY.Text = "0";
//
// panelbm
//
this.panelbm.BorderStyle = System.Windows.Forms.BorderStyle.Fixed3D;
this.panelbm.Controls.Add(this.button2);
this.panelbm.Controls.Add(this.tbShearX);
this.panelbm.Controls.Add(this.button1);
this.panelbm.Controls.Add(this.tbShearY);
this.panelbm.Controls.Add(this.tbRotaionAngle);
this.panelbm.Controls.Add(this.textBox4);
this.panelbm.Controls.Add(this.label8);
this.panelbm.Controls.Add(this.label3);
this.panelbm.Controls.Add(this.tbScaleX);
this.panelbm.Controls.Add(this.label9);
this.panelbm.Controls.Add(this.textBox2);
this.panelbm.Controls.Add(this.label5);
this.panelbm.Controls.Add(this.label2);
this.panelbm.Controls.Add(this.label1);
this.panelbm.Controls.Add(this.tbTranslationY);
this.panelbm.Controls.Add(this.textBox3);
this.panelbm.Controls.Add(this.tbTranslationX);
this.panelbm.Controls.Add(this.textBox1);
```

```
this.panelbm.Location = new System.Drawing.Point(5, 41);
this.panelbm.Name = "panelbm";
this.panelbm.Size = new System.Drawing.Size(136, 371);
this.panelbm.TabIndex = 26;
//
// tbTranslationY
//
this.tbTranslationY.Location = new System.Drawing.Point(78, 55);
this.tbTranslationY.Name = "tbTranslationY";
this.tbTranslationY.Size = new System.Drawing.Size(50, 20);
this.tbTranslationY.TabIndex = 5;
this.tbTranslationY.Text = "0";
//
// tbTranslationX
//
this.tbTranslationX.Location = new System.Drawing.Point(78, 31);
this.tbTranslationX.Name = "tbTranslationX";
this.tbTranslationX.Size = new System.Drawing.Size(50, 20);
this.tbTranslationX.TabIndex = 4;
this.tbTranslationX.Text = "0";
//
// textBox4
//
this.textBox4.Cursor = System.Windows.Forms.Cursors.Default;
this.textBox4.Location = new System.Drawing.Point(10, 215);
this.textBox4.Name = "textBox4";
this.textBox4.ReadOnly = true;
this.textBox4.Size = new System.Drawing.Size(118, 20);
this.textBox4.TabIndex = 30;
this.textBox4.Text = "СДВИГ";
this.textBox4.TextAlign =
System.Windows.Forms.HorizontalAlignment.Center;
//
```



```

// textBox3
//
this.textBox3.Cursor = System.Windows.Forms.Cursors.Default;
this.textBox3.Location = new System.Drawing.Point(10, 152);
this.textBox3.Name = "textBox3";
this.textBox3.ReadOnly = true;
this.textBox3.Size = new System.Drawing.Size(118, 20);
this.textBox3.TabIndex = 29;
this.textBox3.Text = "Поворот";
this.textBox3.TextAlign =
System.Windows.Forms.HorizontalAlignment.Center;
//
// textBox2
//
this.textBox2.Cursor = System.Windows.Forms.Cursors.Default;
this.textBox2.Location = new System.Drawing.Point(10, 90);
this.textBox2.Name = "textBox2";
this.textBox2.ReadOnly = true;
this.textBox2.Size = new System.Drawing.Size(118, 20);
this.textBox2.TabIndex = 28;
this.textBox2.Text = "Масштабирование";
this.textBox2.TextAlign =
System.Windows.Forms.HorizontalAlignment.Center;
this.textBox2.TextChanged += new
System.EventHandler(this.textBox2_TextChanged);
//
// textBox1
//
this.textBox1.Cursor = System.Windows.Forms.Cursors.Default;
this.textBox1.Location = new System.Drawing.Point(10, 5);
this.textBox1.Name = "textBox1";
this.textBox1.ReadOnly = true;
this.textBox1.Size = new System.Drawing.Size(118, 20);

```

```
this.textBox1.TabIndex = 27;
this.textBox1.Text = "Перемещение";
this.textBox1.TextAlign =
System.Windows.Forms.HorizontalAlignment.Center;
this.textBox1.TextChanged += new
System.EventHandler(this.textBox1_TextChanged);
//
// tbShearX
//
this.tbShearX.Location = new System.Drawing.Point(78, 241);
this.tbShearX.Name = "tbShearX";
this.tbShearX.Size = new System.Drawing.Size(50, 20);
this.tbShearX.TabIndex = 11;
this.tbShearX.Text = "0";
//
// tbRotaionAngle
//
this.tbRotaionAngle.Location = new System.Drawing.Point(78, 178);
this.tbRotaionAngle.Name = "tbRotaionAngle";
this.tbRotaionAngle.Size = new System.Drawing.Size(50, 20);
this.tbRotaionAngle.TabIndex = 8;
this.tbRotaionAngle.Text = "0";
//
// tbScaleX
//
this.tbScaleX.Location = new System.Drawing.Point(78, 116);
this.tbScaleX.Name = "tbScaleX";
this.tbScaleX.Size = new System.Drawing.Size(50, 20);
this.tbScaleX.TabIndex = 6;
this.tbScaleX.Text = "1";
this.tbScaleX.TextChanged += new
System.EventHandler(this.tbScaleX_TextChanged);
//
```

```

// label3
//
this.label3.AutoSize = true;
this.label3.Font = new System.Drawing.Font("Microsoft Sans Serif", 11.25F,
System.Drawing.FontStyle.Regular, System.Drawing.GraphicsUnit.Point,
((byte)(204)));
this.label3.Location = new System.Drawing.Point(7, 118);
this.label3.Name = "label3";
this.label3.Size = new System.Drawing.Size(65, 18);
this.label3.TabIndex = 29;
this.label3.Text = "Κοэффици.";
this.label3.Click += new System.EventHandler(this.label3_Click);
//
// menuStrip1
//
this.menuStrip1.Items.AddRange(new
System.Windows.Forms.ToolStripItem[] {
this.помощьToolStripMenuItem});
this.menuStrip1.Location = new System.Drawing.Point(0, 0);
this.menuStrip1.Name = "menuStrip1";
this.menuStrip1.Size = new System.Drawing.Size(606, 24);
this.menuStrip1.TabIndex = 27;
this.menuStrip1.Text = "menuStrip1";
//
// помощьToolStripMenuItem
//
this.помощьToolStripMenuItem.DropDownItems.AddRange(new
System.Windows.Forms.ToolStripItem[] {
this.тыикToolStripMenuItem});
this.помощьToolStripMenuItem.Name = "помощьToolStripMenuItem";
this.помощьToolStripMenuItem.Size = new System.Drawing.Size(68, 20);
this.помощьToolStripMenuItem.Text = "Помощь";
//

```

```

// тЫКToolStripMenuItem
//
this.тЫКToolStripMenuItem.Name = "тЫКToolStripMenuItem";
this.тЫКToolStripMenuItem.Size = new System.Drawing.Size(180, 22);
this.тЫКToolStripMenuItem.Text = "ТЫК";
this.тЫКToolStripMenuItem.Click += new
System.EventHandler(this.тЫКToolStripMenuItem_Click);
//
// Form1
//
this.AutoScaleDimensions = new System.Drawing.SizeF(6F, 13F);
this.AutoScaleMode = System.Windows.Forms.AutoScaleMode.Font;
this.AutoSize = true;
this.ClientSize = new System.Drawing.Size(606, 535);
this.Controls.Add(this.panelbm);
this.Controls.Add(this.panel1);
this.Controls.Add(this.menuStrip1);
this.Icon = ((System.Drawing.Icon)(resources.GetObject("$this.Icon")));
this.KeyPreview = true;
this.MainMenuStrip = this.menuStrip1;
this.Name = "Form1";
this.Text = "Form1";
this.KeyDown += new
System.Windows.Forms.KeyEventHandler(this.Form1_KeyDown);
this.panelbm.ResumeLayout(false);
this.panelbm.PerformLayout();
this.menuStrip1.ResumeLayout(false);
this.menuStrip1.PerformLayout();
this.ResumeLayout(false);
this.PerformLayout();

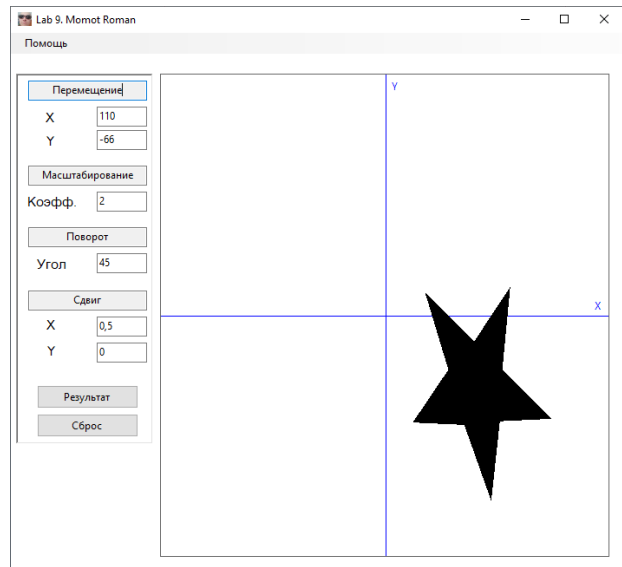
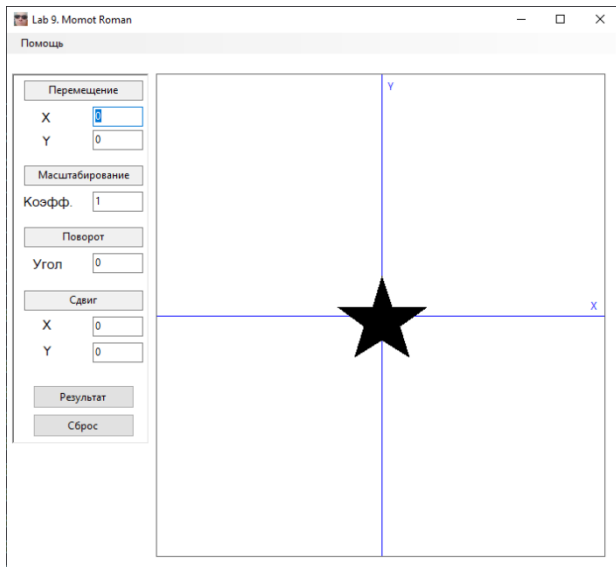
}

```

#endregion

```
private System.Windows.Forms.Panel panel1;
private System.Windows.Forms.Button button2;
private System.Windows.Forms.Button button1;
private System.Windows.Forms.Label label9;
private System.Windows.Forms.Label label8;
private System.Windows.Forms.Label label5;
private System.Windows.Forms.Label label2;
private System.Windows.Forms.Label label1;
private System.Windows.Forms.TextBox tbShearY;
private System.Windows.Forms.Panel panelbm;
private System.Windows.Forms.TextBox tbShearX;
private System.Windows.Forms.TextBox tbRotaionAngle;
private System.Windows.Forms.TextBox tbScaleX;
private System.Windows.Forms.TextBox tbTranslationY;
private System.Windows.Forms.TextBox tbTranslationX;
private System.Windows.Forms.TextBox textBox1;
private System.Windows.Forms.TextBox textBox2;
private System.Windows.Forms.TextBox textBox3;
private System.Windows.Forms.TextBox textBox4;
private System.Windows.Forms.Label label3;
private System.Windows.Forms.MenuStrip menuStrip1;
private System.Windows.Forms.ToolStripMenuItem
помощьToolStripMenuItem;
    private System.Windows.Forms.ToolStripMenuItem тЫКToolStripMenuItem;
}
}
```

## Результат роботи



## Висновки

При виконанні даної лабораторної роботи було набуто навичок по перетворенню на площині.