

# Computer Graphics Lab 5: Two Dimensional Transformations

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## Aim

To apply basic 2D transformations such as Translation, Scaling, Rotation, Reflection, and Shearing for a given 2D object.

## Description

In this experiment, we perform 2D transformations on a 2D object, such as a line segment.

The 2D transformations include:

1. **Translation:** Moving the object from one position to another along a straight line.
2. **Scaling:** Changing the size of an object by scaling factors along the X and Y axes.
3. **Rotation:** Rotating the object about the origin by an angle  $\theta$ .
4. **Reflection:** Producing a mirror image of the object about a given axis.
5. **Shearing:** Distorting the shape of the object along X or Y axis.

## Algorithms

### 1. Translation

$$x' = x + t_x, \quad y' = y + t_y$$

### 2. Scaling

$$x' = x \cdot s_x, \quad y' = y \cdot s_y$$

### 3. Rotation

$$x' = x \cos \theta - y \sin \theta, \quad y' = x \sin \theta + y \cos \theta$$

## 4. Reflection

X-axis:  $(x, -y)$ , Y-axis:  $(-x, y)$ , Origin:  $(-x, -y)$

## 5. Shearing

$$x' = x + sh_x \cdot y, \quad y' = y + sh_y \cdot x$$

## Results

All programs successfully displayed the original object and its transformed version on the screen.

## Conclusion

We successfully implemented basic 2D transformations and observed the effects of Translation, Scaling, Rotation, Reflection, and Shearing on 2D objects.