

CSE 352 - ASSIGNMENT 5

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Transformation of Polygons

```
import matplotlib.pyplot as plt
import numpy as np

# Define a Polygon
def define_polygon(points):
    return np.array(points)

# Rotation Operations
def rotate_origin(polygon, angle):
    angle_rad = np.radians(angle)
    rotation_matrix = np.array([
        [np.cos(angle_rad), -np.sin(angle_rad)],
        [np.sin(angle_rad), np.cos(angle_rad)]]
    )
    return np.dot(polygon, rotation_matrix.T)

def rotate_point(polygon, angle, center):
    translated_polygon = polygon - center
    rotated_polygon = rotate_origin(translated_polygon, angle)
    return rotated_polygon + center

# Translation Operation
def translate_polygon(polygon, translation):
    return polygon + translation

def plotting_polygon( n , points , angle_A , x1 , y1 , angle_B , X2 , Y2):
    polygon = define_polygon(points) # polygon definition
    rotated_origin = rotate_origin(polygon, angle_A) # rotated about origin
    rotated_point = rotate_point(polygon, angle_B, np.array([x1, y1])) # rotated about specific point
    translated_polygon = translate_polygon(polygon, np.array([X2, Y2])) # translate the polygon

    # Plot all transformations
    plt.figure(figsize=(8, 8))
    plt.fill(*polygon.T, color='blue', alpha=0.3, label='Original Polygon')
    plt.plot(*polygon.T, marker='o', color='blue')
    plt.fill(*rotated_origin.T, color='green', alpha=0.3, label=f'Rotated about Origin ({angle_A}°)')
    plt.plot(*rotated_origin.T, marker='o', color='green')
    plt.fill(*rotated_point.T, color='orange', alpha=0.3, label=f'Rotated about ({x1}, {y1}) ({angle_B}°)')
    plt.plot(*rotated_point.T, marker='o', color='orange')
    plt.fill(*translated_polygon.T, color='red', alpha=0.3, label=f'Translated to ({X2}, {Y2})')
    plt.plot(*translated_polygon.T, marker='o', color='red')
    plt.title("Polygon Transformations with Filled Colors")
    plt.xlabel("X-axis")
    plt.ylabel("Y-axis")
    plt.legend()
    plt.grid()
    plt.show()
```

```
# Number of vertices
n = 5

# List of vertices as (x, y), last point is same as first for making it a complete polygon
points = [(0, 0), (1, 0), (1, 1), (0, 1), (0, 0)]

# Angle to rotate the polygon about the origin (in degrees)
angle_A = 45

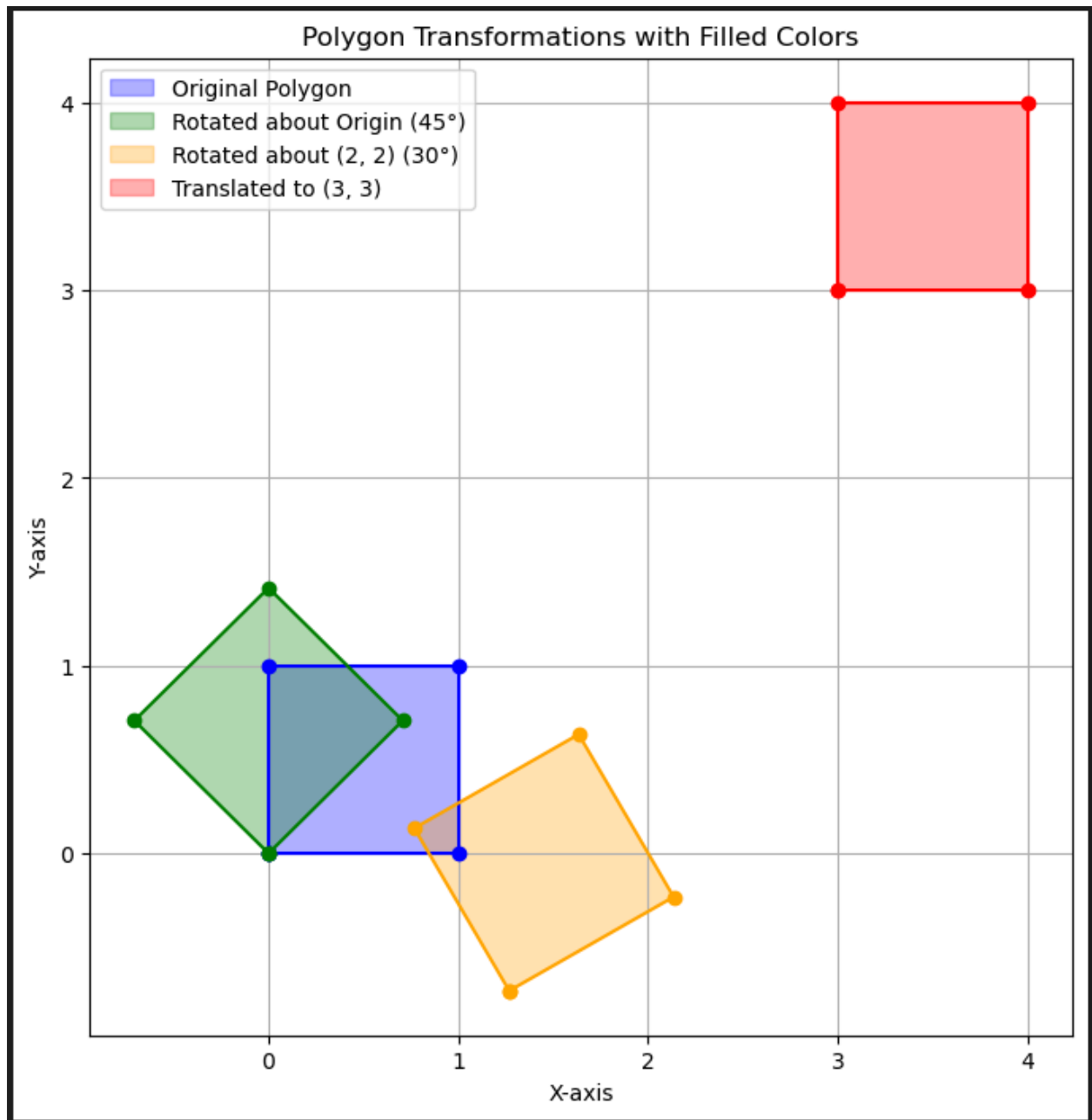
# Point to rotate the polygon about
x1, y1 = 2, 2

# Angle to rotate the polygon about (x1, y1) (in degrees)
angle_B = 30

# Translation coordinates
X2, Y2 = 3, 3

# Plot the polygon with the given transformations
plotting_polygon(n, points, angle_A, x1, y1, angle_B, X2, Y2)
```

✓ 0.1s



For code , refer GitHub

<https://github.com/arnavjain2710/Computer-Graphics-Lab/tree/main/LAB%205>